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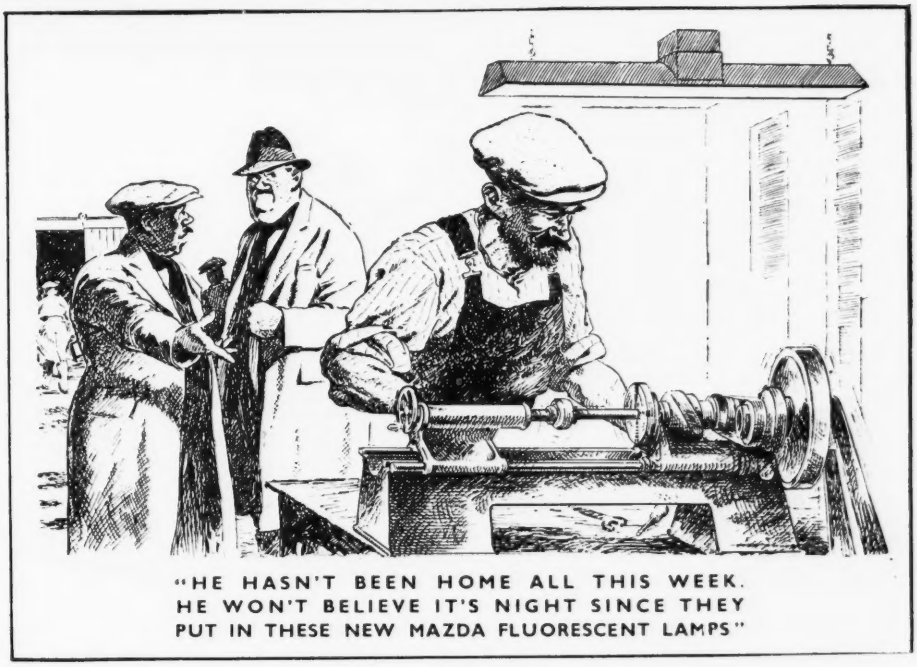

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THE
ELECTRICAL REVIEW

Volume CXXVIII — No. 3319

Friday, July 4, 1941

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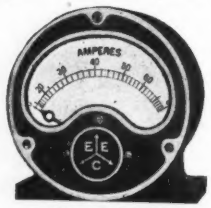

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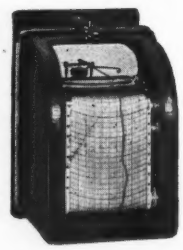

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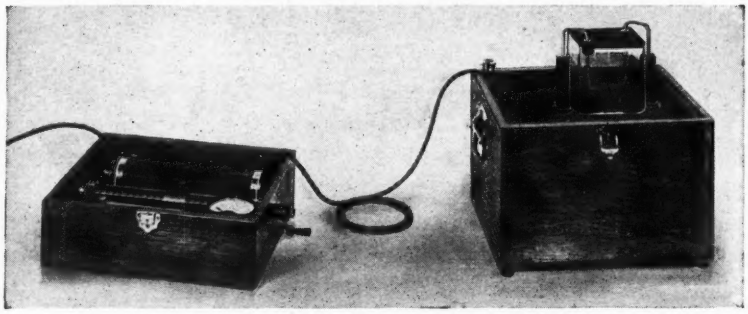

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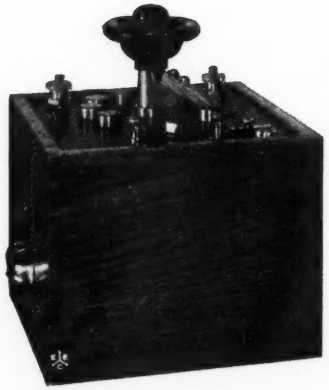

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THE
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THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXVIII. No. 3319 JULY 4, 1941 Price SIXPENCE

What Needs to be Done

The Removal of Irritating Handicaps

AN industry that has advanced as rapidly as public electricity supply has done for nearly sixty years naturally tends to outgrow many well-established practices which once served a useful purpose but do so no longer. That is the more so in the case of electricity supply on account of the way in which the idea behind it has gradually evolved from the restricted one of serving local needs to the broader outlook of making it available to all.

At a time when changes happen quickly (and they are inevitable), it is well to ensure that they are made not merely for their own sake, as this would often be to throw away the fruits of an accumulated wealth of experience, but because they are positively good in themselves. The answer to the question of what is " good " is found more easily than in most fields of human activity. It is that which gives the greatest use of electricity to the greatest number of people. Anything that obstructs the way to this goal should be scrapped.

In the forefront of public irritants, which before the war brought about a demand for the reorganisation of distribution (for which large areas were mooted as a partial solution) and which, incidentally, have not enhanced the prestige of electrical engineers, is the chaos of declared voltages and systems and the divergencies of types of tariff as between one undertaking and another. The latter has the further objectionable feature of sometimes exciting suspicion regarding the good faith of undertakings.

Interchangeability of Apparatus

Next on the list of evils we should put uncertainty as to whether appliances used in one house can be used on removal to another, even if the voltage is the same, without fitting new plugs. And this—like so much else—after years of work of B.S.I. Committees ! Movement of population due to war conditions has doubtless exaggerated the situation, but it provides only an extreme instance of what the public has ordinarily to put up with. One aspect of migration is the difficulty about apparatus sold on easy purchase terms; this should be soluble by general adoption of the I.M.E.A. scheme for the transfer of hire-purchase agreements from one undertaking to another.

Other matters requiring attention were brought out at the recent I.E.E. Informal Meeting on " Looking Ahead." It was shown, for example, that fuses present an obvious inconvenience to the householder, indicating a need for inexpensive mass-produced miniature circuit breakers. Continuing to look at the subject from the consumer's point of view, are electrical engineers altogether satisfied with the electric cooker ? Good as it undoubtedly is in the hands of those who know how to use it properly, can we believe that it really fulfils its mission so long as its design allows prejudices to exist among otherwise reasonable people—prejudices, that is to say, that are not readily removable as a result of a minimum of explanation and instruction. That should be a suitable topic for the new Installations Section of the I.E.E. to discuss as well as a subject for investigation by the Heating, Cooking and Allied Problems Committee of E.R.A.

Standardising Equipment

Lower-voltage cables and accessories present plenty of scope for improvement. There are as in other electrical matters still too many departures from recognised standards, and the standards themselves are too many to encourage economical distribution, as has previously been shown in this journal. This criticism does not apply to the higher voltages where technique has not yet reached a stage at which standardisation is desirable. In this connection, reference may be made to an outstanding British development in the gas-filled cable, and to the potentialities of higher voltages than those yet employed in this country.

As to the desirability of many of the improvements touched upon here—a few only out of the large number that present themselves for consideration—there will probably be little disagreement. The difficulty lies in giving effect to them. A simple illustration of this point has been given recently by a prominent cable engineer, who referred to the existence of two varieties of small cables having the same current rating, viz. 1/.044 and 3/.029. The additions to manufacturing costs and to the space occupied by stocks of each entailed in this duplication find no compensating advantages. Our own preference would be for the stranded type, but the demand for one or the other seems to be about " fifty-fifty."

The point is that it is not now the business of any representative authority of the electrical industry to

determine that one of these cables is superfluous or, broadening the basis to cover all kinds of anomalies, to provide the " drive " required to carry out the wishes of the vast majority of electrical engineers to clear up many matters that tend to detract seriously from the value of electricity supply.

Commissioners and Fire Watching

WE have recently reported cases in which employees of electricity undertakings have been summoned for failing to carry out fire-watching duties to which they had been assigned. In one case the defendants said that they wished to appeal to the Electricity Commissioners for their decision and the case against them was adjourned until the Commissioners had been consulted. The Commissioners have now circulated a statement that in future cases of this kind proceedings against the offenders will be taken on their behalf by the Treasury Solicitor and undertakings are asked to furnish particulars of the matter to enable the Commissioners to decide whether proceedings should be instituted.

Forced Circulation Boilers

Some of the advantages of forced circulation that have influenced the decision to install a La Mont boiler at Montaup power station were given by Mr. F. H. Rosencrants at the recent Mid-west Power Conference, U.S.A. These include the absence of rolled joints due to the ease of welding the small tubes employed, which moreover allow turbulent flow, thus reducing the steam film on their interiors and lessening the temperature drop through their walls. Since all water is moved once in every 40 seconds, the possibility of " chemical hideout " is said to be almost eliminated, and a wider margin of safety in water treatment is expected, while a thermal capacity of metal and water about half that of a natural-circulation boiler produces a quicker pick-up. A further advantage that has been adduced by British engineers is that greater output is obtained from the same space. Efficiency, the author states, may be slightly less owing to the power taken by the pumps. Steam conditions of the Montaup unit, *Power* says, will be 2,000 lb. per sq. in. and 960 deg. F. Its capacity will be 650,000 lb. per hour—nearly twice that of the largest La Mont boiler now in commission, viz., the 350,000-lb. unit at Deptford West station of the London Power Co. Forced circulation finds its most obvious scope at high pressures, but the steam conditions at Deptford are only 375 lb. per sq. in. and 790 degrees, so that other considerations predominated there.

Dry-Contact Rectifiers

AFTER thirteen years of useful service given by the copper-oxide rectifier and, more recently, the selenium rectifier with its greater temperature range, the fundamental theory underlying asymmetric conduction still remains dark. The interest taken in the subject was indicated by the large attendance at last week's I.E.E. meeting and the prolonged discussion of the papers by Dr. A. L. Williams and Mr. L. E. Thompson and by Mr. E. A. Richards. The theory works, as the progress in application from the charging of small batteries to manifold uses in practically all branches of engineering shows, but it cannot be left at that. Further developments beyond the outputs now obtainable and into the field of the mercury-arc rectifier seem now to depend upon obtaining more definite knowledge of what actually does happen at the plane of contact that forms the one-way insulating barrier between the conductor and the semi-conductor.

The Truce

IN order to clear up any misunderstanding which a previous letter of his may have caused, Mr. W. J. Sandeman, chairman of the Executive Committee of the British Commercial Gas Association, writes to the *Gas Times* to say that it cannot be too strongly emphasised that the report by the Joint Gas and Electricity Committee does not preclude national advertising by either the gas or the electricity supply industries. It merely stipulates that such advertising shall not be of a nature disparaging to the other industry.

Paper Rationing and the "Electrical Review"

READERS have by now become so accustomed to the rationing of all sorts of commodities in their daily life that it will come as no surprise to them to learn that the ELECTRICAL REVIEW *is experiencing great difficulties in the matter of paper supplies.*

It is not that we have shown any lack of foresight in this matter, for considerable stocks of paper were built up in anticipation of the shortage. The position has now been reached when such stocks as we retain must be conserved and we are no longer able to draw upon them in the way we have been permitted to do in the past months. Moreover, permission to buy has for some time been reduced to a third of our pre-rationing quantity and is now reduced to one-fifth. Whatever economies were possible have been effected, such as a reduction some months back of the page area and the adoption of a lighter paper. These economies, however, have only served to delay more drastic action and have not provided a solution for a paper which maintains a high circulation and carries a large volume of advertising.

Having considered the problem in all its aspects we have arrived at a decision which readers will find put into effect with our August 1st issue. As a wartime measure, therefore, the ELECTRICAL REVIEW *will appear with a very much reduced page size, but will be able to retain as much or more space for editorial matter by an increase in the number of editorial pages whilst the number of pages available for advertisers' announcements will remain as at present, although the page area will be reduced.*

We are confident that this change, the necessity for which is obvious in the circumstances, but is also a matter outside our own control, will receive endorsement from our readers and advertisers alike. The usefulness of the journal to the industry will be in no way impaired, whilst the reduction in paper consumption will mean that we are conforming to the requirements of the Paper Control and doing our part, however small, in saving essential shipping space.

Those who are by nature conservative may find it a little difficult to get accustomed to the REVIEW *in its new guise, but having already handled samples of the new size we believe that its convenience and portability will soon overcome any early hastily-formed prejudices.*

Electrical Recording

Quantitative Registering Instruments

By T. Thorne Baker,
F.Inst.P., A.M.I.E.E.

The author describes the various systems which are in use for electrical recording particularly electro-photographic methods

IT is frequently necessary in electrical practice to make a quantitative record on paper, the amount of current registered being extremely small. Direct recordings on a moving chart can be made in a variety of ways, or the record may be made by photography, by electro-chemical means, or by purely mechanical methods. With suitable amplification methods the recording instrument can in addition be employed as a means of controlling a variety of industrial processes.

The immense range of response of photographic material available for recording the movements of oscillographs and other instruments can be appreciated from the fact that the " fastest " obtainable film is at least 100,000 times more sensitive than the " slowest " material. We find in practice the movement of a spot of light recorded on a sensitised paper-covered drum travelling at a peripheral rate of one inch per hour on the one hand, and impulses having a frequency of 10,000 c/s or more recorded on film travelling at several hundred feet per minute on the other.

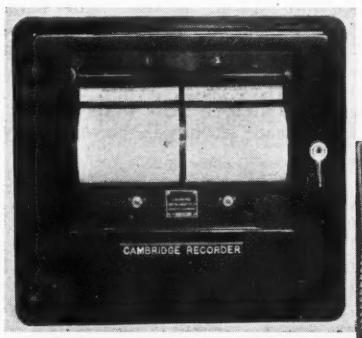


Fig. 1.—Cambridge recorder making six to eight simultaneous traces in different colours on monthly chart

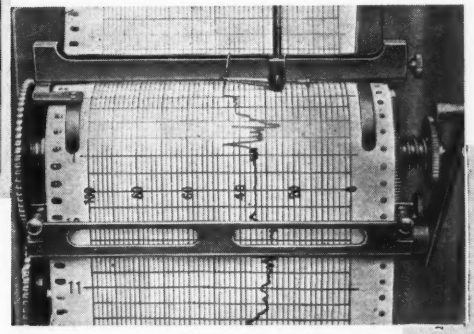


Fig. 2.—Elliott inking recorder with syphoning reservoir

In the recording of some physical phenomena exposures of as little as one millionth of a second are made by the illumination from a condenser discharge across a spark gap. The speed of a photographic film is thus far in excess of the figure of merit of the shortest period galvanometer or light valve, while its resolving power may be as high as 75 lines per millimetre.

In the simplest case of electrical recording the needle of a galvanometer can be provided with a pen which traces an ink line over the moving chart, but when very small currents are involved the torque may be insufficient for the degree of accuracy required. Large numbers of direct recording instruments are in use, and thread recorders are proving very successful in eliminating the friction due to the use of an ink-pen.

In these the pointer of a moving coil galvanometer is automatically depressed at regular intervals on to an inked thread which in turn marks the travelling chart and leaves a series of inked dots which form a discontinuous line. When records from several instruments are being made on the same drum, as, for example, from two or more thermo-electric pyrometers, the inking can be differently spaced for each one, or (as in the case of the Cambridge " Model A " thread recorder) it is possible to employ a different coloured ink for each instrument.

From six to eight simultaneous records can be obtained in different colours on a monthly chart about 5 in. wide (see fig. 1). The ink threads travel across the width of the meter parallel to the drum in the top of the instrument. Clock-driven rocking mechanism brings the ink threads in turn under the galvanometer pointer, and also connects them in turn with two, three, or four different circuits. Two galvanometer movements are fitted in the one case in the example illustrated, the outside dimensions of the meter being 18 in. by 13 in. by 16.8 in.

Elliott Bros. (London), Ltd., supply recording instruments which can be fitted with a reservoir that ensures a continuous supply of ink by syphoning over from the horizontal reservoir shown in fig. 2. Nalder Bros. & Thompson also fit syphon pens fed from a reservoir to their recording instruments. An ink-pen recording (volt) meter is another instrument of this type included among the products of Evershed & Vignoles, Ltd.

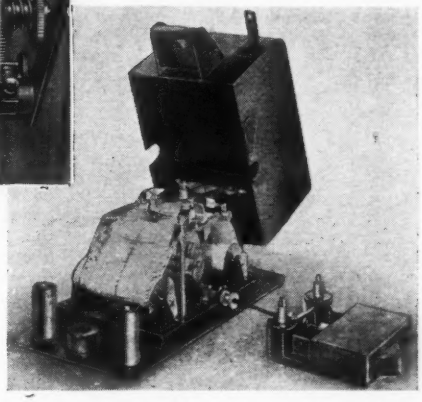


Fig. 3.—Everett Edgcumbe transit vehicle shock grapher with door-opening recorder attachment

The inking device used in Everett Edgcumbe instruments is fed through a capillary tube from a dustproof reservoir to the inking nozzle, the weight of the ink being kept constant and counterbalanced. In other instruments made by this firm an " inkless grapher " is employed. The " Synlock " motor

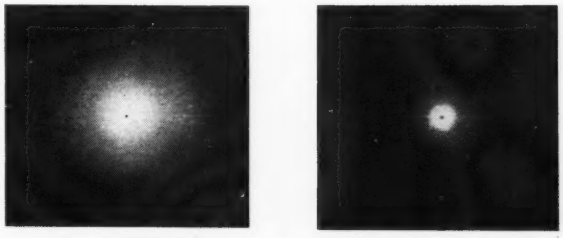


Fig. 4.—Positive and negative Lichtenburg patterns

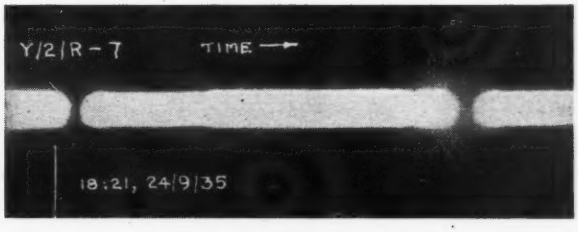


Fig. 5.—Actual klydonograph record

which drives the chart raises a tapping bar at frequent intervals and presses a hardened stylus against the back of the paper. This causes a small dot to appear on the *front* of the chart, at intervals of 7½ secs. on a 24-hour clock, or every minute on a 7-day chart.

The Everett Edgcumbe shock grapher was designed to assist in the detection of causes of damage to goods during rail or road transit; the record in this type of apparatus is produced through the agency of a black-lead stylus which moves over the chart. The device is illustrated in fig. 3 with an attachment for recording the times at which the door of the vehicle is opened or closed.

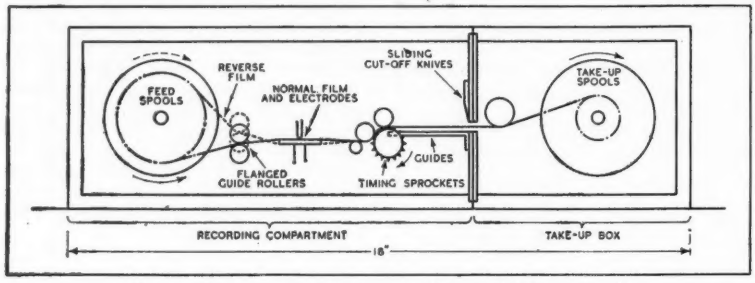


Fig. 6.—Diagrammatic representation of klydonograph

Use of electrolytic action to produce a record on chemically prepared paper was made just 100 years ago by Bain in his chemical telegraph, and later by Bakewell and Caselli. Such paper, typical of pole-finding paper, can be extremely sensitive. Paper impregnated with a solution of soluble starch containing about 5 per cent. of potassium iodine will give a deep brown mark under a metal stylus due to the reaction of the liberated iodine on the starch. Paper travelling with a peripheral speed of 50 ft. per minute will give a quantitative marking with currents of considerably less than a milliampere. The paper will discriminate between both the period and the amplitude of the signals, and has been successfully employed in several early systems of photo-telegraphy in spite of its somewhat rapid fading. Permanent chemical markings can be obtained with other materials, but there is always the drawback that the recording paper must be kept at a fixed humidity.

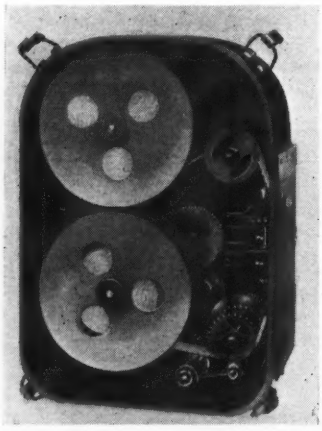


Fig. 7.—Cathode-ray oscillographic recording camera for continuous film

By the use of organic compounds in conjunction with salts of iron, manganese and other metals Friese-Greene succeeded in printing without ink. The type was used as one electrode and the platen or cylinder as the other. In spite of some promising results, however, "inkless printing" has never been proceeded with.

A very ingenious method of recording with hot air was developed by Capt. R. H. Ranger for the radio transmission of pictures, and has been in constant use across the Atlantic. A thin, superficial coating of wax, penetrating as little as possible below the surface, is given to paper, the wax acting as a water repellant. The "pen" recording the signals is an electrically-operated fine jet from which air at a temperature of about 80 deg. C. is directed on to the paper as it passes beneath it on the recording drum. The heat causes the wax to diffuse into the paper and so destroy the repellent action at that spot. When the transmission is concluded, the paper is removed from the drum and rolled up with a soluble ink, which "takes" where the signals have acted, and so the facsimile image is produced.

Most systems of picture telegraphy depend on photographic recording of the signals received from the scanning machine. The strength of a light beam from a fixed source is regulated by the amplitude, or frequency, of the incoming signals. The beam may be intercepted by some form of string galvanometer which acts as a shutter, or light reflected from an oscillograph mirror may be thrown on or off an aperture placed in the light path, behind the aperture being a collecting lens which concentrates the rays upon a point on the sensitive paper. An alternative method is the electrostatic control of a beam of light by polarisation, as in the Kerr cell.

In all such cases the image is purely photographic. But important progress has been made recently in the way of dry recording papers, which give a direct image in full light by the action of a stylus on specially prepared paper. Printed matter and illustrations are transmitted in this way by the Finch facsimile system on 100-ft. rolls of electro-sensitive paper, which is advanced through the gate of the recording instrument at the rate of three feet per minute. These machines are the continuously recording type now in use for providing a "home newspaper" service over a telephone line or radio network, and are being installed by a great number of provincial newspapers in the United States.

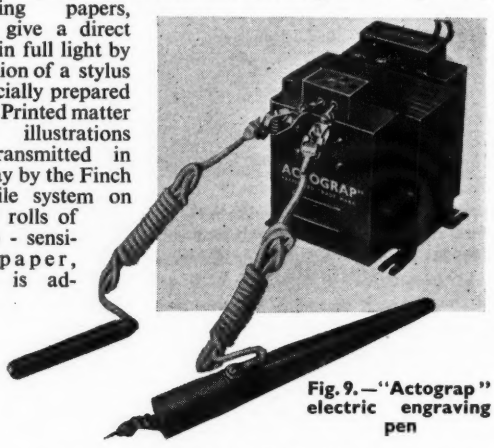


Fig. 9.—"Actograp" electric engraving pen

A dry carbon-impregnated paper is employed, the carbon being incorporated with an orange coloured electro-sensitive material. This coating darkens instantly when a marking voltage of the necessary value is applied to the stylus. Between 80 and 170 V the marking varies from faint to jet black, but as yet the range of gradation obtained in half-tone photographs cannot compare with that of a true photographic image, being rather akin to a photostat copy. A step-up transformer is employed in the rectifier unit of the recording machine to raise the AC signal voltage to the necessary marking potential; a full-wave rectifier valve converts the signal energy DC voltage, the cathode being connected to the recording stylus.

Two phenomena unpleasantly familiar to manufacturers of sensitised photographic materials are defects produced by pressure and static discharges, the latter causing tree-like black markings on development. Modern research has almost eliminated both forms of defect, but use has been made of the so-called distinctive

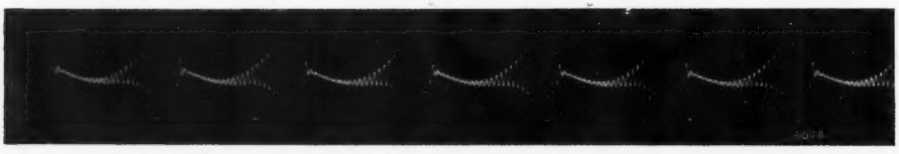


Fig. 8.—Cathode-ray oscillogram exemplifying high "writing speed"

"Lichtenburg" patterns caused by the momentary application of a high voltage across electrodes between which a photographic film is placed, so making the klydonograph a useful recording instrument for determining the effects of surges, particularly lighting discharges, upon overhead lines. Two recording films are ordinarily used, each one passing between a hemispherically ended electrode and a plate connected to earth, the polarity between the pair being reversed so that in one case a positive discharge from the rounded electrode (which gives the more characteristic figure) is assured. The difference between the positive (left) and negative (right) effect is illustrated in fig. 4 together with an actual klydonograph record (fig. 5) and a diagram of the instrument itself (fig. 6). These are reproduced by permission of Mr. J. L. Candler and the British Electrical and Allied Industries Research Association. Mr. Candler's experiences on an 11-kV line owned by the Yorkshire Electric Power Co. were described in the *Journal* of the I.E.E. for January, 1941.

Photographic Methods

Oscillograms necessarily take the form of photographic impressions, and material of varying types is available, from the original "falling plate" to high-speed negative roll film. Hardy has suggested a simple optical system with a single lens in front of the galvanometer mirror, whereby 25 lines per mm. can be practically resolved. The resolving power of fine grain emulsioned film is from 55 to 75 lines per mm. With an astigmatic optical system it is, however, possible greatly to increase the illumination on the recording film, while the rotation of the galvanometer mirror about a horizontal axis does not cause a vertical deflection of the image.

Light from a low-voltage metal filament lamp is employed for low frequency work, while DC automatic arcs with the carbons at right angles are used in high frequency recording. The rays are focused upon the vibrating mirror by a special condenser, with slit aperture; an image of the slit is thrown by a small lens in front of the mirror upon a third lens immediately in front of the drum, which takes in a fairly wide beam and concentrates it into a minute image of the slit on the sensitive surface.

The camera may be in the form of a simple drum fitted in a dark box, the paper or film travelling over the drum at from six to twelve metres per second. A form of camera for using continuous lengths of perforated cine film is made by the Cambridge Instrument Co. (fig. 7) and similar types of camera are used in cathode-ray oscillograph recording, but by means of electrically-controlled exposures traverses ranging from 100 milliseconds to 3 microseconds can be secured. Clear records can be obtained on photographic plates at a "writing speed" of 55 km. per second. One of these (fig. 8) is reproduced by permission of the Cambridge Instrument Co. It represents 21 kc/s oscillation heavily modulated by a distorted 800 c/s note, recorded on a small drum camera with one ten-thousandth second time marks.

A recent application of cathode-ray recording described by Mason & Moir (*Journal*, I.E.E., February, 1941) is to the investigation of acoustics in cinema auditoria. An impulse of a train of waves of predetermined frequency lasting over a period of from 0 to 0.05 sec. was applied to the loud-speakers. The output of a microphone in the auditorium was applied to the vertical deflector plates of a cathode-ray tube, the scanning of which was synchronised with the impulses so that a continuous image resulted. The resolving power of the cathode-ray tube being too low to show the complete wave-form of the impulse, the record appeared as a luminous vertical band. The photographic records, compared with those made with a loud-speaker in a highly damped test chamber, showed remarkably little distortion in a well-designed auditorium.

In special cases of recording a beam of cathode rays is used directly upon the photographic film, the exposure being then only a fraction of that needed when fluorescent screen recording. Another recent type of screen recording which deserves mention is the photography of fluorescent screen images in X-ray examination of medical cases, where a miniature image is obtained which effects considerable economy.

Electric "Pencils"

Useful for marking tools, jigs, engine parts and metals is the "Actograp" electric pen (fig. 9) made by Lorant & Co., Ltd. A powerful arc is produced by a writing point fitted to an electro-magnetic vibrating system; energy is drawn from a 6-V battery, or from AC mains through a small transformer. The writing point engraves lines, signs, figures or letters in all metals, the depth of engraving depending on the handling. Electric writing "pencils" of a similar type are supplied by Stanelco Products and E. H. Jones (Machine Tools), Ltd., the latter having six degrees of writing strength. Another well-known engraver is a Runbaken product, one of this firm's models having the distinct advantage of being fitted with a variable control for fine or deep marking; a power model is made for repetition work on hardened steel.

Canadian Wartime Electrical Policy

COMPLETE revision in the most drastic manner of the entire policy, promotional effort, advertising and merchandising campaigns and general structure of every branch of the electrical industry to meet wartime needs was forecast at a convention of the Canadian Electrical Association in Vancouver recently. The launching of a drive by power companies to reduce the amount of energy consumed by the customers, the elimination of easy terms to make appliances harder to buy, and the bringing together of manufacturers with a view to reducing their output to a minimum quantity of wartime "stripped" models of essential appliances only and complete elimination of the production of all luxury types of appliances were amongst a few of the points urged by the speakers in advocating an all-out war policy. Staggered hours of work, daylight saving, promotion of gas, wood, coal and other fuels as an alternative to electric power, the possibility of companies purchasing surplus power from customers' standby plants and other startling changes were advocated.

While it was clearly stated that at the present time, save for one or two areas, there is no power shortage in Canada, the electrical industry was alive to the fact that development of war industry and intensive war efforts might create situations where steps would be necessary to relieve power production of some normal demands to release power for war needs. It was suggested that under such emergency conditions the first step would be to cease the generation of steam for industrial use, a step already taken by many companies. Next in order would be the diversion in whole or part of power used for domestic electric water heaters. While street and large commercial lighting has a safety and police value in emergency, this was suggested as a means of further conserving power by reducing the supply. It was suggested that in case of need not only should supplies to industrial plants, hospitals, hotels, department stores and other establishments already operating their own stand-by or heating plants which could generate power, be cut down, but that regard should be paid to the possibility of securing surplus power from these sources for other needs.

The employment of the promotional staff of public utility companies to promote conservation of power by further utilisation of available equipment, by development of a plan of exchange of motors in industrial plants, etc., so that all power wastage was eliminated, by close checking of industrial and commercial lighting to see that while it was adequate it had no excess volume, and to check on potential power supplies available from auxiliary equipment of customers was advocated. It was felt that all these steps should be taken at once by the industry and a plan developed whereby voluntary co-operation between customers and the utilities could put the arrangement into effect when necessary, and without any Government regulation, or detailed compulsory measures.

Manufacturers came under fire for their short-sighted policy in refusing to back the retailers in their application to the War Time Prices and Trade Board for permission to add to the appliance tax a "mark-up" to cover the investment needed to finance this tax by the dealer and his costs involved in collecting it. It was claimed the Board had indicated that this lack of support by manufacturers was the sole reason why this permission was refused to dealers, and it was now resulting in dealers refusing to sell appliances, as conditions were such that the tax meant that they were selling below operating cost and were being gradually forced out of retail business. In the case of fixtures, lamps, etc., a "mark-up" on the cost plus tax is permitted.

The necessity for the establishment of a high standard of industrial activity with a low standard of living for all was urged. Tapering off of promotional and load building efforts, deferring of maintenance where possible, discouragement of new power connections, and fuller utilisation of existing facilities at the sacrifice of the quality of the service rendered the public were advanced as courses which the power industry might have to adopt.

PERSONAL and SOCIAL

News of Men and Women of the Industry

CHANGES in the Cabinet were announced at the beginning of the week. **Mr. Oliver Lyttelton** leaves the Board of Trade upon being appointed to special duties abroad and his place as President is taken by **Sir Andrew Duncan** who thus returns to the post which he left last October. **Lord Beaverbrook** succeeds Sir Andrew as Minister of Supply. **Col. J. J. Llewellin** and **Sir Arthur Salter,** respectively Parliamentary Secretaries to the Ministries of Transport and Shipping are appointed Joint Parliamentary Secretaries of the new Ministry of War Transport.

The Association of Consulting Engineers has elected as non-practising members Messrs. A. H. Dykes, J. Frith, S. C. Lewis and H. M. Sayers. The Committee says that it is particularly fitting that **Mr. Dykes** should be the first to be elected under the amendment to paragraph 5 of the Articles of Association, having regard to his connection with the founding of the Association in 1913 and to his work as honorary secretary extending over twenty-three years.

The Committee has placed on record its appreciation of the valuable services of **Mr. S. C. Lewis** as honorary treasurer, from which capacity he has resigned after a term of over fourteen years. A radio set was presented to him by the members upon his retirement.

After forty years' municipal service, **Mr. F. L. Ogden,** borough electrical engineer, Oldham, is to retire at the end of July. The Electricity Committee has appointed **Mr. R. G. Whitehead,** who is Mr. Ogden's deputy, and **Mr. E. Binns,** station superintendent, as joint chief engineers and managers. Before entering the service of Oldham Corporation, Mr. Ogden served with the Northwich Electric Supply Co. (now the Mid-Cheshire Co.) and Harrogate Corporation. He has been in full charge of the department since 1918.

Mr. T. W. Dann, M.Eng., A.M.I.E.E., has been appointed chief engineering assistant to the Poplar Borough Council Electricity Department. Mr. Dann spent six years in the workshops of Cammell Laird & Co., Ltd., and the English Electric Co., Ltd., followed by four years in the Switchgear Department of the General Electric Co., Ltd. For the past twelve years he has been technical assistant with the Northampton Electric Light & Power Co., Ltd. He takes up his new duties on Aug. 1st.

I.E.E. Students' Awards.—The Council of the Institution of Electrical Engineers has awarded the following students' premiums for papers presented during Session 1940–41:—(Value £10): To Messrs. W. H. Coats, B.Sc., (South Shields) and W. E. Darby (Newcastle-under-Lyne). (Value £5): To Messrs. F. B. Atkinson, B.Eng. (Bebington), R. Bruce, M.Sc. (Newcastle-on-Tyne), D. B. Corbyn (Chippenham), R. D. Haigh (Liverpool), J. Hare (Newcastle-on-Tyne) and M. J. H. Lemmon (Pinner, Middlesex).

Mr. Alastair Elder has been appointed mains superintendent by the Derby & Notts Electric Power Co. He was formerly with the Dundee Corporation Electricity Dept. to which he was apprenticed after leaving the Dundee Technical College.

Mr. A. F. Hardcastle, of Doncaster, has been recommended for the position of mains superintendent at Birkenhead.

Mr. T. H. Carr, power station superintendent at Derby, has been recommended by the Bradford Corporation Electricity Committee for appointment as deputy city electrical engineer and manager at a salary of £850, rising to £1,000.

Ald. A. Hewitt was re-elected chairman of the North Wales and South Cheshire Joint Electricity Authority, at its recent annual meeting held at Llandudno. The General Purposes Committee was also re-elected with the addition of **Mr. G. K. Paton** (North Wales Power Co.) and **Councillor A. E. Stabler** (Wrexham).

Three employees of the East Anglian Electric Supply Co., Ltd., have been commended for gallantry during air raids; they are **Messrs. C. W. Langmaid, T. N. Nicholson** and **J. W. Payne.**

Bedford Corporation Electricity Committee has arranged for **Mr. H. B. Jenkins,** the deputy electrical engineer, who will reach the retiring age in August, to remain in office for another six months.

Chester Corporation Electricity Committee has granted permission to **Mr. E. F. Humphrey,** mains superintendent, to withdraw his resignation and to take three months' sick leave.

Mr. L. Woodcock, formerly on the Brierfield Council's electrical staff, has left to take up his new post as maintenance engineer with the B.B.C., and his colleagues have presented him with a fountain pen as a parting gift.

Mr. R. W. Gregory has been elected chairman of the North-Eastern Centre of the Institution of Electrical Engineers for the 1941–42 session, and **Mr. H. V. Field** becomes chairman of the Tees-side Sub-Centre. In neither case was balloting necessary.

Blackburn Corporation has approved the recommendation of a special committee that the salary of the electrical engineer, **Mr. R. H. Harral,** for additional work and responsibility which he has undertaken, shall be increased from £1,100 per annum to £1,300 as from June 1st, 1940, rising to £1,400 on June 1st, 1941.

Mr. D. J. McClelland, consulting engineer, has resigned from his membership of the State Electricity Commission of Victoria after nine years' service, owing to the demands made on his time by his private practice.

Obituary

Sir C. Herbert Smith.—It is with regret that we have to announce the death on June 22nd, which occurred at the age of seventy, of Sir Charles Herbert Smith, chairman of the Midland Electric Manufacturing Co., Ltd., a position which he had held since M.E.M. became a public company in 1926. He had wide business interests, being also chairman of James Booth & Co., Ltd., deputy-chairman of Brown Bros., Ltd., and director of W. & T. Avery, Ltd., W. Canning & Co., Ltd., Radiation, Ltd., and other companies. He was also a life governor of Birmingham University, and was knighted in 1938 for political and public services in the City of Birmingham.

The late Sir C. Herbert Smith

Mr. E. Harlow.—We regret to record the death of Mr. Edward Harlow, M.I.E.E., which occurred on June 25th, at Datchet, at the age of sixty-two. Mr. Harlow resigned from the position of station engineer at the Bankside station of the City of London Electric Lighting Co., Ltd., early this year owing to ill-health. He had been forty years with the company at Bankside, being station superintendent from 1909 to 1931.

Mr. Edward Rogers Wood, president of the Rio de Janeiro Tramway Light and Power Co. and the Sao Paulo Tramway Light and Power Co., vice-president of the Brazilian Traction Light and Power Co., and a member of the board of Barcelona Traction Light and Power Co., has died at the age of seventy-five.

Will.—Dr. David Robertson, B.Sc., M.I.E.E., Professor of Electrical Engineering at Bristol University, left estate valued at £10338, (£8,756 net personalty).

Parliamentary News

By Our Special Reporter

B.C. & H. Company's Coal Supplies

IN the House of Commons last week Mr. de Rothschild asked the Secretary for Mines whether his attention had been called to the difficulties experienced by the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Company in replenishing its reserve stocks of coal; and whether, since factories and works engaged in essential production relied on this company for their supplies of electricity, he would get into touch with the Central Electricity Board in order that steps might be taken to avoid the possibility of curtailment of supply to these users.

Mr. D. Grenfell said he understood that this company had hitherto drawn its supply from the grid. Steps were being taken to improve the coal stocks held by grid stations, and he had no reason to believe that these were in any danger of failure or curtailment of supply through shortage of coal. The position at the company's station was that there was already a substantial tonnage of coal in stock, and the necessary steps would be taken to provide the supplies required when the station came into operation.

Grampian Electricity Bill

On June 24th Sir D. Herbert, Chairman of Committees, put before the Speaker certain facts which he contended established a *prima facie* case of privilege. He said that if the Speaker supported that view he intimated that he would move that the matter be referred to the Committee of Privileges. The matter arose in relation to the Grampian Order in connection with which a Confirmation Bill had been placed on the Order Paper.

On June 11th a printed circular letter addressed to all Members of Parliament had come into his hands which was the document complained of. This document, which was headed, "The Highland Development League," contained the expression "The seeming irregularities in the procedure" by which the Bill was advanced a further Parliamentary stage. It seems probable, and it turned out to be the case, that this expression had reference to the action of the Lord Chairman of Committees and the Chairman of Ways and Means in referring the Order to a Scottish Commission under the Private Legislation (Scotland) Act, 1936, and also to the conduct of two Members of the House of Commons who were members of the Commission.

He, therefore, wrote to the three signatories of the document asking them to explain what was intended by the words "seeming irregularities in procedure." He received a reply from them giving an assurance that no improper implication had been intended, and if it seemed to him (Sir D. Herbert) that the words contained any such implication they begged to tender a sincere apology. Had the letter stopped there he would not have troubled the House in the matter, but in the remainder of the letter the three signatories not only set out the allegations in detail but attempted to justify them.

The Speaker said that this was rather a difficult and complicated case but undoubtedly a matter of principle was involved. He thought a *prima facie* case of privilege had been made out. The matter was, therefore, referred to the Committee of Privileges.

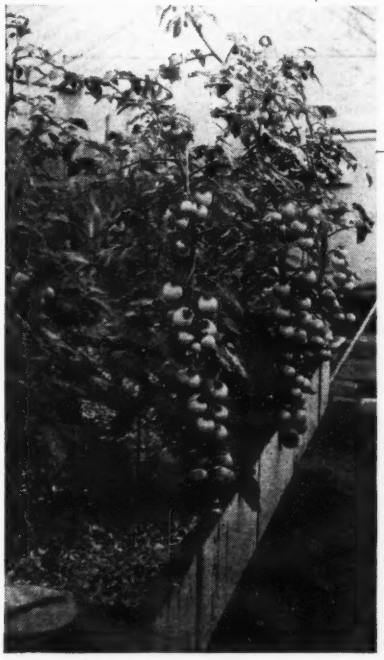
Soil-less Cultivation

Sub-Irrigation Culture Method

THOUGH it cannot be regarded as a substitute for "Digging for Victory" and though it has not yet reached large-scale commercial operation, the new science of soil-less cultivation of plants has already met with a considerable measure of success and provides an interesting subject for further investigation. The latest and most promising method to be experimented with, namely sub-irrigation culture, relies on electricity for its successful operation and Capt. S. R. Mullard, M.B.E., M.I.E.E., whose name is very familiar in the radio world, one of the pioneers of this method of cultivation, has let us have details of the system he has devised at the Bakeham Farm Nurseries, Englefield Green, Surrey, in collaboration with Prof. R. H. Stoughton, Professor of Horticulture in the University of Reading.

Describing the process in the *Journal* of the Royal Horticultural Society, Prof. Stoughton says that the principle is to grow the plants in a waterproofed tank, provided at the bottom with an inlet, and filled with clean gravel, cinders, or even small coke. A separate tank at a lower level is provided to hold the nutrient solution and the solution is pumped up at intervals into the plant tank and allowed to flow back into the supply tank, which may be constructed of wood, metal or concrete, and can be of any dimensions.

The tanks used by Capt. Mullard are built up to any required length from pre-cast reinforced concrete sections, each 2 ft. long and either three or four feet wide. The bottom of the tank slopes to a central drainage channel and the base of the section is cast with a wide "keel" which provides strength and serves to support the tank above ground level. The ends of the tank are closed by special half-sections and each section is cast with a tongue at one end and a groove at the other, the joint being made with hot bituminous asphalt. Each junction is covered on the inside with a strip of thin roofing felt stuck round with asphalt. The drain channel is covered with guttering to prevent the gravel getting into the supply pipe, while the feed pipe is sealed into the inlet hole and lies about four inches along the channel. A supply tank is placed as near as possible to the growing tank with its top below the bottom of the latter.



Tomato plants ready for their first picking, twelve weeks after planting in a sub-irrigation trough

A connection is made from the supply tank to the growing tank through a centrifugal pump of sufficient output to flood the growing tank in about 40 minutes. Actually the pump used by Capt. Mullard is a Stuart Turner direct-coupled unit driven by a ¼HP motor. This is controlled automatically by means of a Honeywell-Brown "Utility" type switch situated at the end of the tank. Normally the pump is in operation for about two hours a day in summer and one hour in winter, being set in operation at 9.30 a.m. and 4.30 p.m. in summer and mid-day in winter, though this depends on the plants grown. The arrangement of the plant is shown in the diagram, which, together with the illustration of the tomato plants, which we reproduce above, has been lent to us by Capt. Mullard.

If the whole installation is above ground the pump is best mounted at the side of the supply tank, below the solution level and directly connected to it by a flexible pipe. This arrangement obviates the necessity for priming the pump or installing a foot valve on the intake. If the supply tank is sunk below the ground level, however, the pump should be mounted above it to avoid the danger of flooding. In this case it is necessary to provide a foot valve on the intake pipe to keep the pump primed and a separate return pipe from the growing tank to the supply tank to allow for draining the solution back.

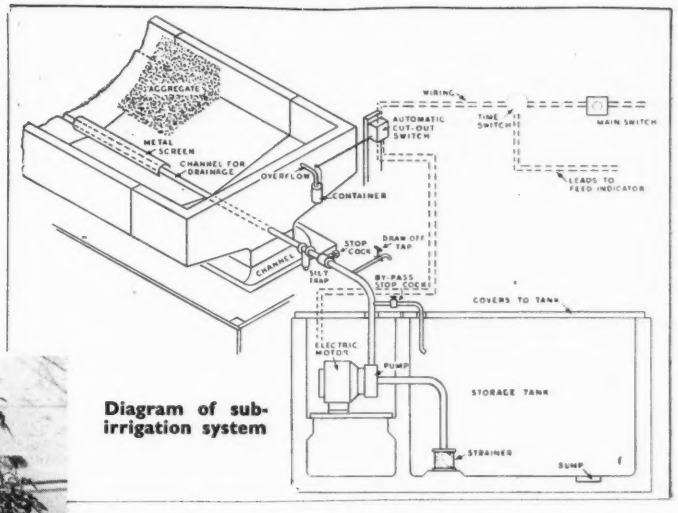


Diagram of sub-irrigation system

The tank is filled with washed silica gravel graded between about ⅜ and ⅝ in., to within ½ in. of the top. The supply tank is then filled with water made slightly acid (pH 6.0–6.5) with sulphuric acid, and the pump operated to flood the gravel. Several successive pumpings and drainings are carried out until the reaction remains constant and the tanks are then emptied and the nutrient solution mixed in the supply tank pumped on to the gravel and left in contact with it for 24 hours. The solution is then drained back into the supply tank and the installation is ready to receive the plants.

Nutrient Solutions

An extremely large number of formulæ for nutrient solutions have been suggested by various experimenters, and unscrupulous persons have sought to exploit the ignorance of the public by advertising special mixtures of salts with supposedly miraculous influence upon plant growth. Usually these are mixtures of simple salts sold at many times their normal price. Actually to secure plant growth a sufficient supply of seven elements and traces of four others are required and it is necessary that the main elements shall be supplied in the right proportions, taking into account the particular plant grown and the seasonal conditions, especially with regard to sunshine and temperature.

Compared with other methods of soil-less cultivation the system has a number of advantages. Thorough aeration is provided by the draining away of the solution after flooding, since air is drawn down into the medium; the plant has a firm anchorage and its roots are undisturbed; control of the nutrient and water supply is complete since the number of pumpings can be varied at will; the solution can be sampled, adjusted or altered without interference with the plants; economy in nutrients is effected since the same solution is used over and over again; and, finally, the system can be made entirely automatic in operation (with the exception of the adjustment of the solution) by the employment of a time-switch.

In addition to the installation at Bakeham Farm Nurseries, Capt. Mullard has also supplied similar complete equipment consisting of a tank 70 ft. long by 3 ft. wide to Mr. J. B. Stevenson, of Colham Green Nurseries, near West Drayton; an installation consisting of a 40 ft. long by 4 ft. wide tank to Reading University; and a small installation of two tanks, pumps, etc., to Sir Daniel Hall, of the Lord Wandsworth Agricultural College, Long Sutton. All these installations, we are informed, are giving satisfactory results.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions.

The Association of Scientific Workers

YOUR correspondent, "Professional Engineer," pours abuse on trade-unionism in general and strongly objects to the idea of bargaining for what he calls "prizes-all-round." He cites a somewhat outworn system of business as having been responsible for building up the electrical industry, but fails to appreciate that business itself, whether on a strictly competitive or on a collective basis, is just the sum and substance of numerous bargaining operations.

It is worth noting that unlimited competition in business has for many years been abandoned in the larger enterprises and collectivism by the combination of separate enterprises into fewer and fewer competitive groups still continues. Even where separate groups exist, competition is limited by various associations. Your correspondent's "competitive enterprise" moves daily towards monopolies; employers protect themselves against their customers through price-fixing associations and against their employees through employers' federations.

Just as the manufacturer sells his products to his customers, so does the employee engineer—professional or manual—sell his ability, his initiative, his mental or physical effort for the service of his employer and this act of selling implies a bargain. Nowadays nearly all professional engineers and scientists are employees and the point at issue is not whether or not they should bargain for conditions of employment, but whether they should bargain for them collectively or individually. Since in either case they will be bargaining with highly organised and powerful trade unions of employers, wise professional men see the value in bargaining collectively through their own trade union.

REINET FREMLIN,
Secretary.
Association of Scientific Workers.
London, W.C.1.

IT is strange to find a "Professional Engineer" who is still living, apparently, in the year 1850. In 1941, when every industry is organised by enormous monopolies and combines—the electrical industry not the least of them—it is pitiful to read about individualism and "competitive enterprise" having made industry what it is or being responsible for "continual technical improvements."

Has "Professional Engineer," I wonder, ever asked himself why, in this competitive and individualistic world, engineering employers themselves have banded into a powerful and united engineering and allied employers' association? Is there not something a little fantastic in a situation where scientific and technical workers disdain organisation whilst their employers take every advantage of trade union methods?

The truth of the matter is that all successful professional people owe their position to organised collective action to create and maintain their professional standards. Ask any doctor or lawyer.

J. STEWART COOK, B.Sc.
Windsor.

Use of Power Resources

I READ your leading article of June 27th with interest and particularly with approval on the points made concerning the use of imported oil. But I am not so sure that your aim and purpose of converting energy to social advantage by the encouragement of the use of as great an amount of horse-power as possible per person is as desirable as you conceive it to be. It may seem desirable to any particular industry, but is it desirable for the welfare of the human race?

For many years before the war our national policy seemed to be to invest as much capital as possible in foreign countries; in order that these countries could acquire sterling to pay interest to our investors it was essential that they should sell us their produce. They thus found a ready market here for their raw material to the great disadvantage of our primary industries and agriculture.

This led to production on a grand scale including mass production of foodstuffs abroad. Consequence, soil erosion abroad and the decay of agriculture at home. Further consequence, the Battle of the Atlantic and the fact that a Continental power with a few hundred submarines can imperil our whole existence. Now the Ministry of Food is urging us to re-discover the old feeding traditions of the era before the Industrial Revolution, making use of good English vegetables and herbs and throwing aside that symbol of modern intelligence the tin-opener.

The truth is, before the war we lived in an "ersatz" world. This was largely brought about by the mass production of everything so that individual ability and craftsmanship were discouraged and our creative powers, as a nation, atrophied. No one bothered to become even a mediocre musician against the competition of the radiogram: once the early boom was over, no one devised his own wireless circuits against the cheap mass-produced hire-purchased article. The "live" theatre struggled against the competition of ghosts flashed on a screen. Petrol conveyed us everywhere and we were in danger of our feet becoming rudimentary.

I hope the lesson will not be lost and that engineers will plan with a sense of social responsibility and not let themselves be stampeded into a commercial drive for the mechanisation of everything. Undue emphasis may have been laid on such things as thermal and mechanical efficiency, rationalisation of industries, etc., without realising that there is such a thing as social efficiency, which will not be increased by turning mankind into tabloid-fed robots.

Let us do all we can to encourage individual effort, a self-reliant population, arts and crafts in towns, villages and homes so that we may re-discover the joy of creative effort. And in this electricity can play a part far more effectively than competitive forms of energy. National prosperity will only depend on the most efficient application of mechanical energy when we know what social efficiency is.

G. DIXON,
Borough Electrical Engineer.
Colchester.

Exports and the Empire

YOUR leading article in the issue of February 28th last on the maintenance of export markets is most interesting.

Although born and educated in England I have spent the greater part of my life in North America and South Africa, so perhaps my views are not now what they might have been, had I remained in England.

You state "it has been considered that the British Empire is a perfect economic unit." I do not agree with this statement. Until there is a more equitable distribution of the Empire population a perfect economic unit cannot exist. The British overseas dominions are grossly under-populated, but they will be largely peopled, eventually, by many other European nationalities. We cannot lock up so large a portion of the earth's surface to suit our "economic unit"; *i.e.*, to be producers of food and raw materials in exchange for British manufacturers.

The people in Great Britain should take a greater interest in this subject. If manufacturers would move their plants and workpeople to other parts of the Empire they could still retain their businesses, assist in populating our overseas lands with the right type of people, and at the same time lessen the pressure of population in Great Britain. It must be acknowledged that the number of people in your small area creates a tremendous burden on food supply and necessitates transport problems that, in wartime, become very serious. Industrial development in the overseas dominions is inevitable and the British people would be wise to recognise this now, and thus safeguard their future.

These remarks may not suit vested interests, but the fact remains they you cannot have an economic balance until there can be brought about a better population balance. The Empire is an inheritance in which all should be glad to participate. Do not look upon it merely as a means of revenue, but rather as a real opportunity to relieve people from overcrowded conditions and assist them towards a better life.

H. A. TINSON.
Johannesburg, South Africa.

The Grouping of Contractors

THE article in your June 20th issue, by Mr. J. Mortimer Hawkins, is one that calls for very careful study in the light of the future economic planning of our country. Your criticism, however, that it "savours of guild (gild) socialism or Fascist corporate economy," is in the first place inaccurate, and secondly unfair.

Gild socialism is not possible without the background of that particular type of national life which it had when it had its fulness of being. The scheme proposed could be developed on corporate lines, without being Fascist. You have overlooked the wide difference between *corporatisme d'état* and *corporatisme d'association.*

F. B. DUTTON.
Crewe.

I.E.E. North-Eastern Centre

THE annual report of the North-Eastern Centre of the Institution of Electrical Engineers shows that the attendance at the nine meetings held during the 1940–41 session averaged fifty and that the Faraday Lecture attracted 268, of whom over 200 were non-members. Five Centre members were awarded premiums for papers presented. The Centre membership continues to increase, being now 764. This figure includes the 131 members of the Tees-side Sub-Centre, which held six meetings at which the average attendance was twenty-four. The Students' Section had 273 members and the average attendance at meetings was twenty-eight,

Metal Rectifiers

Papers and Discussion at the I.E.E.

THERE was a large attendance on Thursday last week at the first ordinary meeting to be held in the evening for over a year at the Institution of Electrical Engineers in London. Two papers were presented, descriptive of so-called metal rectifiers, which name is not really appropriate because it is improbable that a wholly metallic example will ever be discovered. The name is understood to mean a large-area contact rectifier in which the action appears to be purely electronic without any visible signs of chemical change during operation. None of the theories so far advanced completely fits the case of the copper-oxide variety.

The first paper to be presented, by Dr. A. L. WILLIAMS and Mr. L. E. THOMPSON (Westinghouse Brake & Signal Co., Ltd., research laboratory), briefly outlined the histories of both copper-oxide and selenium rectifiers. The latter was discovered long before the former, but the selenium type did not become prominent until quite recently whereas the copper-oxide rectifier has been used extensively for fourteen years. Reference to the main developments that have brought them to their present state of efficiency led the authors to outline modern methods of manufacture.

The fundamental DC characteristics upon which their performance depends, and the manner in which they are influenced by various factors were described. Discussion of the simple basic theory which governs all types of rectifiers, in relation to their chemical and physical forms, showed the metal type to be undoubtedly of great complexity, for investigators are called upon to examine an effect which is being influenced and partly masked by a host of factors, each of which is perhaps only slightly less complicated than the primary phenomenon itself.

The essential property is asymmetric conductivity; rectification occurs at the contact between two dissimilar substances and it is in this respect that most progress is to be expected. Messrs. Williams and Thompson concluded their paper with an explanation of a method by which correct working conditions may be deduced from the characteristics they had previously described. A number of possible ratings have been derived, but they need to be examined in the light of many other factors, even in the most simple cases.

Principles of Operation

Three working principles are, first, the current-carrying capacity can be increased by enlarging the surface area of the element and, secondly, the voltage capacity can be raised by using processes which increase the impedance of the element. In the vast majority of cases these measures are insufficient, and the current and voltage ranges are extended by the third method, which is to interconnect numbers of elements in parallel and in series.

At present, copper-oxide elements are made in sizes from 0.005 to 400 cm.^{2} and three different processes are used, while selenium elements of from 0.02 to 200 cm.^{2} are made by one process only. Elements up to an area of 1 cm.^{2} are best made in the form of discs, which are assembled in insulating tubes, and from this size up to about 100 cm.^{2} a washer-shaped element with a central hole for assembly on a single spindle is used. For still larger sizes, plates with two or more holes for assembly are employed.

The different sizes of copper-oxide elements are produced by treating blanks of appropriate dimensions, and sometimes selenium elements are made in a similar fashion. In a more modern process, however, selenium rectifiers are manufactured in large areas which are sub-divided into the smaller sizes after the completion of all processes. It is not yet practicable to make selenium elements in such minute sizes as the smaller copper-oxide discs.

It is rarely necessary to connect disc rectifiers in parallel, because the current-carrying capacity can be very easily increased by using a larger size, but it is often desirable to connect numbers in series to meet voltage requirements, and the tube form of assembly lends itself readily to this. Thus, single unit assemblies containing up to nearly 200 discs in series are commonly used.

Selenium Types

The second paper, by Mr. E. A. RICHARDS (Standard Telephones & Cables, Ltd.), was concerned solely with selenium rectifiers, and included a brief account of the theory of operation. After describing how the discs are manufactured and formed, the effects of temperature variation, ageing and capacitance upon the voltage current and voltage resistance characteristics were indicated. Next the design of actual rectifiers was dealt with, for resistive or inductive loads; the mathematical theory of the latest method of design for battery charging rectifiers was included. Methods of construction that improve cooling, so enabling output to be increased, were illustrated and in final reference to diverse applications it was pointed out some of the most interesting cannot for war reasons be spoken of just now.

Prof. C. L. FORTESCUE opened the subsequent discussion with a statement that sufficient was not yet known about the processes that went on within this class of rectifier. When more became known one would be more inclined to consider the ideal curve and not talk so glibly about efficiency. There was no genuine explanation why the capacity of such devices was so great, or what the so-called barrier layer really was.

Dr. A. SPEIGHT pointed out that each face of a single copper crystal had a different work function; the energy required to withdraw electrons through each face was not the same. There did not appear to be any difference spectroscopically between selenium components with indefinite lives and others which failed in a few weeks. Prof. FINCH explained that the barrier layer was not sharply defined, but diffused into adjacent layers and so complicated investigation. Similarly the potential barriers faded away gradually within the crystal, not abruptly. The barrier layers would be affected by the displacement of surface copper atoms that were subjected to strain.

B.B.C. Experience

Mr. H. L. KIRKE spoke, as a user, of the successful employment of these rectifiers in B.B.C. control room circuits since 1935. More recently they had been utilised in transmitter circuits, although rotary machines were still largely used for energising the filaments of large valves. The authors' claims in respect of efficiency had been borne out and the funnel cooling system saved floor space, which was a valuable consideration in building up radio transmitters.

Mr. R. E. BLAKEY suggested that it might be unwise to select copper that was too pure. It was desirable to be more explicit about time effects than the authors had been. With regard to grain size and hardness, annealing could be harmful but not in relation to hardness alone. Assembly could influence the quality of the product. Mr. V. H. GILBERT spoke at length of similarities he had noticed between light-sensitive and rectifying cells of the selenium type, suggesting that data curves extended to minus temperature might be informative.

Mr. A. BETTERSTONE doubted whether the internal resistance of metal rectifiers could be less than that of the thermionic class at high voltages. Could the claims being made in respect of Continental and American rectifiers be substantiated? Mr. R. W. CHAMNEY spoke of the use in Post Office communication circuits of copper-oxide rectifiers in great quantities and for many varieties of purposes; there must be at least 150,000 of the smaller sizes in use. They were of tremendous utility to communication engineers, but their high self-capacity was somewhat of a difficulty. Mr. R. NIXON asked whether the negative resistance coefficient with temperature could be made sufficiently stable to serve for compensating for voltage drop in coils. Mr. W. A. HIBBERD referred to rectifier drives for small motors, remarking that the smaller size of the selenium type compared with the copper-oxide variety was quite important in some cases in P.O. service.

Mr. R. A. WOODALL mentioned the trouble-free use of rectifier equipment for starting aero-engines, mounted on trolleys for transportability. His experience of such starters suggested that copper-oxide rectifiers in combination with inductor alternators might ultimately replace the DC generators that were at present driven off the aircraft engine shafts. Thus, electrical interference caused by commutators would be avoided and the amount of attention rendered necessary by vibration would be reduced. The forced air cooling available on most aircraft might enable smaller rectifiers to be used, weight being an important consideration in the case of aircraft. Mr. W. HALFIELD commented upon ageing tests carried out five years ago on fifty rectifier installations in this country, mentioning that the circuit rearrangement finally agreed to was satisfactory commercially but not entirely so technically.

The authors reserved their replies for publication in the *I.E.E. Journal*.

New California Cyclotron

SOME particulars of the largest cyclotron yet designed, which is now under construction at Berkeley, California, are given in the *Review* of the Rockefeller Foundation. The metal of the magnet alone will, it is said, weigh over 4,000 tons. The voltage is given as from 100 million to perhaps 300 million, which will extend penetration in air to 140 ft. compared with the 5 ft. obtainable with existing cyclotrons.

The purpose of the new cyclotron is to impart such velocities to atomic particles by means of electric impulses that they can penetrate and explore the nucleus of the atom attacked instead of breaking off its external parts only. The estimated cost of constructing and housing the apparatus is $1,150,000.

Furnace Circuit-Breakers

Factors which Determine Selection

By R. S. Bennett, A.M.I.E.E., A.M.I.Mech.E., and C. V. Lewis, M.I.Mar.E.

ARC furnace load follows a duty cycle in which generally there is a prolonged overload or melting-down period followed by a short period at normal load, and finally a long period at light load or refining period. The duration of the overload period varies between 30 and 40 per cent. of the total time cycle, but depends upon the melting practice and class of steel to be produced.

The furnace transformers have an RMS rating with sufficient overload capacity to deal with the large kVA input required during the melting-down period. The overload required may be double the RMS rating of the transformer. The circuit-breaker must have a similar rating to that of the transformer. Several types of circuit-breakers are used for the control of arc furnaces. They can be divided into two main groups : British practice is to use the oil circuit-breaker whilst Continental and American practice is to use the air-break or air-blast types.

When arc furnaces were first installed, American and Continental designers realised that the associated circuit-breakers required special consideration, but in England conditions were less satisfactory, as, until recently, it was apparently left to the design engineer to put forward a suitable circuit-breaker, but, as he was not given essential information, the wrong type of gear was applied in a large number of cases with consequent trouble in service.

Experience gained with circuit-breakers controlling eight arc furnaces with capacities ranging from 5 to 30 tons in association with transformers rated between 1,500 and 7,500 kVA

Considerable progress has been made in England with an air-blast type of circuit-breaker, which would appear to include all the special features required for application to arc-furnace load. In our opinion the air-blast breaker is the correct type for arc-furnace duty and within the next few years it will be increasingly employed, not only for this purpose, but also for normal duties.

Before installing a circuit-breaker for any duty, it is necessary to know the number of operations the mechanisms will be required to make. Generally, the primary winding of an arc-furnace transformer is arranged to be connected delta and star and may have between one and six tapping points. It is possible, therefore, to obtain between two and twelve secondary voltages. In certain cases all twelve secondary voltages are employed. Depending upon the melting practice, records show that an arc-furnace circuit-breaker may have to complete between 200 and 400 closing operations in a six-day working week. The exact number of operations of the mechanisms depends upon the available number of voltage taps, the class of steel to be produced and the melting practice. An arc-furnace circuit-breaker requires to complete a considerably greater number of operations than one designed for normal duty.

One of the primary considerations in the selection of a circuit-breaker for arc-furnace duty is, therefore, sound mechanical construction. In general, the mechanisms are solenoid operated, arranged for remote control, and should close the breaker with 80 per cent. of normal full voltage applied.

In order to eliminate faulty operation under all conditions, time-limit fuses should not be employed. Those formerly fitted for the control of the furnaces here mentioned and on a number of older circuit-breakers have now been replaced by inverse definite time-limit relays. It is thus possible to ensure that the gear always breaks the magnetising current of the transformer, although it may be possible, under certain conditions, to close the breaker with the furnace electrodes in contact with the steel, *i.e.*, under short-circuit conditions. In order to afford full protection quick-acting trip coils have been fitted with very satisfactory results.

With oil circuit-breakers used for arc-furnace duty, there are a number of important points to consider, these including size of tank, quantity of oil in tank, type of breather, speed of operation of the contacts, clearances to earth and between phases, and the type of insulating bushes or porcelains through the tank cover.

Effect of Carbon Deposits

When an arc is broken under oil, local heating takes place. With repeated arcing, especially if the quantity of oil in the tank is small, local temperatures may rise to the point at which some cracking of the oil takes place. This is evidenced by the formation of very finely divided particles of carbon or carbonaceous matter. At the same time quantities of combustible gases are produced, chiefly methane, sometimes accompanied by hydrogen and traces of nitric oxide. Under certain conditions the gases may build up to sufficient quantity to come within explosive limits. This condition has been known to cause several gas explosions. Our experience is that oil circuit-breakers for arc-furnace duty require a large volume of oil in big tanks and large effective breathers. With small tanks and a small volume of oil constant attention is needed and maintenance costs are extremely high.

Finely divided particles of carbon or carbonaceous matter separated from the oil due to repeated arcing may be washed up the sides of the tank and deposited on the live legs and other parts inside the tank. Tests on the oil in accordance with B.S.S. 148-1933 have shown that, unless this finely divided carbon is present in excessive quantity, it does not affect materially the dielectric strength or the flash point of the oil, although it causes it to be blackened. Numerous tests have shown that if the carbon is present in small quantities the flash point tends to increase.

The amount of carbon can be considerably reduced by selecting the most suitable speed of operation of the contacts. On one of the large furnaces mentioned an existing oil circuit-breaker was used which had been connected to a circuit for normal duty, and after connection to the furnace circuit required weekly attention. Tests showed that the average operating speed of the contacts was ½ ft. per sec. The average speed of operation of the contacts was progressively increased up to 5 ft. per sec. Whereas in the first case it was necessary to clean away all carbonaceous matter and replace the oil once a week, with the higher speed it is now necessary to inspect the circuit-breaker and change the oil only once a month.

Oil contaminated by finely divided carbon can be made available for further use by means of a filter press. If, however, its neutralisation value increases unduly after being in service it should be completely discarded as it cannot then be revived by filtration. It is of no use, however, to make provision for such special features as large tank, large volume of oil, large effective breathers and good insulating properties unless carefully planned maintenance is followed.

The " De-ion " type of breaker which contains no oil has had considerable success in America. The principle of operation is simply that the arc formed on opening the main contacts in air is forced into a de-ionising chamber where it is split up into a number of small short arcs in series. These small arcs are made to rotate at high speed over insulated copper plates until they are extinguished and de-ionised at current zero. The insulation resistance is thus made to rise and the arcs prevented from being re-established. The circuit can generally be ruptured in one half-cycle, *i.e.*, extremely rapid arc extinction is established.

A number of breakers of this type are operating on very arduous arc-furnace duty in America, and reports over a period of several years show that they are giving very satisfactory service with exceptionally low maintenance costs. Thus, in one American works, a 2.5-kV breaker is operating 15,000 times a year; in another works fifteen 15-kV breakers are operating 10,000 times a year, whilst in a third case a 15-kV breaker is operating 50,000 times a year.

In order to ensure adequate clearance to earth and between phases, it is recommended that for arc-furnace duty, circuit-breakers of the next higher voltage to that of the circuit to which they are to be connected should be installed.

National Postal Auction

WITH a view to aiding the Red Cross Agriculture Fund, a National Postal Auction has been arranged of gifts presented by manufacturers, including some well-known electrical concerns, whose products are used by the farming community, and by other friends of agriculture. We have received a catalogue of the lots for auction which shows a wide variety of products for sale; the farm equipment section, for instance, ranges from a caterpillar tractor retailed at £650 to a 5s. sparking plug, while there are other sections covering seeds, fruit trees, etc.; veterinary medicines, insecticides, etc.; feeding stuffs and fertilisers; lime, sand, gravel, etc.; sports, games, books, etc.; and " various things—mostly to eat, drink and wear." Bidders will be glad to hear that no coupons are required for the lots of clothing, knitting-wool, etc., listed in the last mentioned section. Those who do not wish to bid for any of the lots are not debarred from contributing to the Fund, and donations may be sent to N.P.A. Sub-Committee, Red Cross Agriculture Fund, 30, Belgrave Square, London, S.W.1, from which address copies of the catalogue can be obtained.

COMMERCIAL and INDUSTRIAL NEWS

Electricity Commissioners and Fire Watching. "Reservation" Ruling

Fire Watching at Power Stations

THE Electricity Commissioners have notified electricity supply authorities that arrangements have been made whereby proceedings relating to offences against the Fire Prevention (Business Premises) Order, 1941, will in the case of premises forming part of any electricity undertaking in England and Wales, be undertaken on their behalf by the Treasury Solicitor.

If electricity supply authorities consider it necessary to bring to the notice of the Commissioners any serious cases of non-compliance with the Order, they should furnish a summary of the facts to the Commissioners, who will then call for such detailed information as they may require to enable them to decide whether proceedings should be instituted. In the case of Scottish undertakings the decision will rest with the Procurator-Fiscal, but a copy of the particulars supplied should be sent to the Electricity Commissioners for their information.

Attention is drawn to the necessity for properly notifying employees of their liability in this matter and of the duties which they are required to perform.

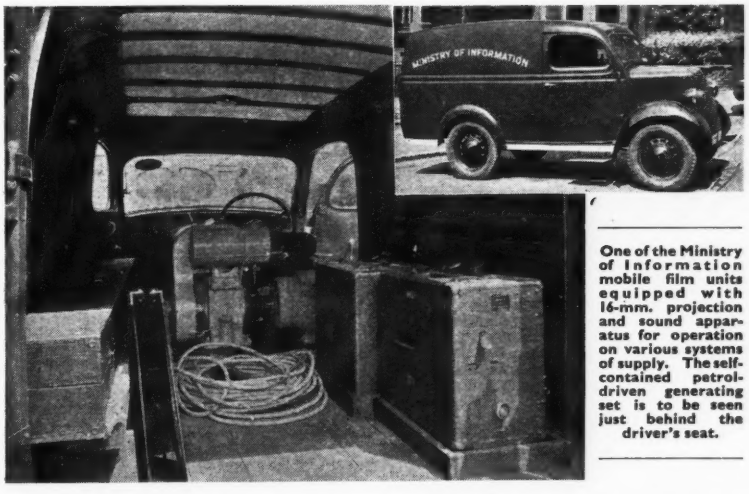
Steel Stocks Census

An inquiry into stocks of steel held by consumers was made on December 31st last. A similar inquiry was commenced on June 30th, when steel users not coming within the purview of the Iron and Steel Control were requested (under the powers contained in Article 4 of the Control of Iron and Steel (No. 8) Order, 1940) to complete and return a "census" form to the Control by July 7th, 1941. Details of stocks of less than 5 tons were not required. Forms were sent to about 30,000 firms.

Mobile Film Units

In order that its films may be shown to the widest possible audiences, even in the most remote rural areas, the Ministry of Information has recently put into commission a fleet of entirely self-contained mobile film units. Housed in a 10-HP Ford van, the equipment is such that it is possible to give sound-film shows no matter how restricted are the facilities available. The G.B. 16-mm. projection and sound apparatus is arranged in two separate compact units, which together with the screen, projector stand and sliding resistance (Curtis) are easily accommodated in the back portion of the van. Any electricity supply from 200 to 250 V, either DC or AC, is suitable for operating the equipment, a variable transformer stepping down the voltage to 110 V, AC, at which the projector works.

If no mains supply is available a neat little generating set situated behind the driver's seat can be brought into service. This comprises a new type of J.A.P. single-cylinder petrol engine running at 2,400 RPM and direct-coupled to a 1-kVA Lancashire Dynamo generator producing 230-V, single-phase, 50-cycle AC. The supply from this is controlled by a 15-A "Prento" bakelite switch and there is a ballast resistance provided to come into operation when the projector is switched off. Mr. J. W. R. Hill, the maintenance engineer in charge of the vehicles, tells us that they are proving most successful and have operated as far afield as the Hebrides. Twenty-seven units are already in service and the number will probably be increased.



One of the Ministry of Information mobile film units equipped with 16-mm. projection and sound apparatus for operation on various systems of supply. The self-contained petrol-driven generating set is to be seen just behind the driver's seat.

Labour Shortage in Glasgow

The director has reported to Glasgow Corporation Education Committee that Darroch & Espie, contractors for the electrical work at Househillwood housing scheme, were not making satisfactory progress under the contract, and that on inquiry he had been informed that while the contractors had full supplies of material to complete the work, they could not obtain the necessary tradesmen, and they suggested if the Corporation could supply the labour they would be prepared to pay the men and so continue to fulfil their contract. The director further reported that he had supplied the contractors with two tradesmen on the understanding that their wages would be paid by the contractors. The Committee has given its approval to this arrangement.

Industrial Registration

To-morrow (Saturday) all men born in the years 1898 and 1899 will be required to register at a Local Office of the Ministry of Labour and National Service, unless they were registered under the Registration for Employment Order on April 5th. On that date about half of the men born in these years were registered, but men employed in a large number of industries, mainly the munitions industries and the industries covered by the Board of Trade's concentration of production scheme, were not required to register. Now, however, all the men born during these years will be required to register whatever their occupation or employment. Those who are already engaged on vital work from which they cannot be spared will not be required to transfer to other work, although they must still register.

Reservation and Deferment

In reply to questions put to him by the Electrical Trades Union, Sir William Beveridge (Ministry of Labour and National Service) states that if the calling up of a man is deferred for a period, and during this period the age of reservation for his occupation is reduced to an age lower than his age at the due date for his registration, the man becomes reserved. It would be just the same if deferment had not been obtained and the age of reservation for the occupation had been reduced while the man was on the Live Register and before an enlistment notice had been issued to him. In other words, an enlistment notice is not sent to a man whose age at the due date for his reservation was above the *present* age of reservation. A reduction in the age of reservation does not affect a man who is already called up.

If a man, at his due date of registration, was below the age of reservation fixed for his occupation, he does not become reserved however long his calling up may be deferred, unless, of course, in the meantime, the age of reservation has been reduced.

Women Cable Makers' Bonus

The Joint Industrial Council for the Electrical Cable Making Industry announces that a revision has been agreed of the service bonus for women in the cable-making industry. The new scale is as follows: After two months' service, 1s. per week; after four months, 2s. per week; and after six months, 3s. per week. This revision will apply for the war period only, and only to those females whose work is satisfactory. It will take effect on the third pay-day in July in respect of the period for which payment is made on that pay-day.

Compensation for Lost Tools

We recently mentioned that claims for compensation for the loss of tools through enemy action would be dealt with by Local Assistance Boards. Some further information on the subject is given in the June *Electrical Trades Journal*, the official organ of the E.T.U. Claims for tools will be limited to a maximum of £50, and applications for compensation must be made within thirty days of loss or damage to the Assistance Board's area office. The E.T.U. suggests that as a precaution members who in general purchase tools for the purpose of their job should at once prepare an inventory, checked by a responsible person—foreman or branch secretary of the Union. This will avoid questions and facilitate settlement if tools are lost.

The Assistance Board meets claims for tools on the basis of prices current at the time of loss, and it will be sufficient in the majority of instances to rely for prices on those current among local dealers at the time when the claim arises.

Colliery Rules

The publication is announced by the Secretary for Mines of a new edition of the reference book entitled "Coal Mines Act, 1911, Regulations and Orders relating to Safety and Health," in which all rules that were in force on December 31st, 1940, are collected together in a form convenient for the use of officials, workmen and students concerned with mines. Its contents include lists of approved types of mine lighting equipment, signalling and telephone gear, shot-firing apparatus and firedamp detectors, together with the names and addresses of their manufacturers. Suspension of the annual revision policy will cause the volume to remain current for an indefinite time. It is obtainable for 2s. 4½d. post free from any bookseller or H.M. Stationery Office, York House, Kingsway, London, W.C.2.

Irish Electric Lamp Quota

The United Kingdom Trade Commissioner in Dublin has notified the Board of Trade of an Order made on May 6th entitled Control of Imports (Quota No. 34) (Revocation) Order, 1941, which provides for the revocation as from May 7th, 1941, of the Control of Imports (Quota No. 34) Order, 1937, and the Control of Imports (Quota No. 34, Eighth Period) Order, 1940, which relate to electric filament lamps of low voltage.

Australian Tariff Decisions

Among the decisions issued by the Australian Department of Trade and Customs

respecting the application of the Australian Customs Tariff are the following electrical items all of which are admitted free under the British preferential tariff:—Rotary, quick-acting, snap type, other than two positional single-circuit switches; rotary, quick-acting, snap type, two positional single-circuit switches for use with electric heating and cooking appliances or with tailors' electric irons, under security; mercury vapour electric lamps, specially designed for use for sterilising by the action of ultra-violet rays; electric engraving tools (excluding transformers imported with and for use therewith).

E.A.W. Conference at Nottingham

Post-war reconstruction is to be the theme of the annual conference of the Electrical Association for Women which is to be held on July 24th and 25th at Nottingham University. At the conclusion of the annual general meeting on the morning of the first day, Mr. J. R. Beard, President I.E.E., will give an address on "Looking Forward." Speakers at the annual luncheon which follows will include the Lord Mayor of Nottingham, Alderman W. Halls, J.P., and the Dowager Lady Swaythling, President, E.A.W. The work of the Association with regard to national service, canteens, etc., and planning for the future will be the topics under discussion at the branch session in the afternoon, while in the evening there will be an informal reception by the officers and members of the Nottingham branch. Friday morning will be occupied by the Council meeting and after an informal luncheon a visit will be paid to the Meridian Works of J. B. Lewis & Sons.

Supply Undertakings' Tax Dispute

On June 26th, the Court of Appeal (Lords Justices Scott, Clauson and Goddard) reserved judgment in several appeals and cross-appeals arising out of a finding by Mr. Justice Lawrence in dealing with cases in the Revenue Paper concerning the Reigate Corporation Electricity Department and the Woking Electric Supply Co.

The main point that was argued was whether certain sums paid by the Joint Electricity Authority to the two undertakings were trade receipts of a revenue nature for the purposes of taxation. The Commissioners of Inland Revenue said that they were not and Mr. Justice Lawrence upheld that view. The Crown appealed against this decision, contending that the payments were trade receipts under an agreement to supply electricity at any specified time from their power stations.

Alleged Electrical "Man-trap"

The Stoke-on-Trent electrical engineer (Mr. H. L. Mills) has drawn our attention to a recent case at Longton Stipendiary Court when H. Williams, Fenton, was summoned for "placing a man-trap with intent that the man-trap should inflict grievous bodily harm upon any person coming in contact therewith."

It was stated for the prosecution (according to the *Evening Sentinel*) that the defendant was fortunate not to be facing a more serious charge. The defendant had a lilac tree in his back yard and to keep children from it he erected a bare wire fence and connected it to the live side of his 240-V installation. Anybody touching the fence in wet weather would almost certainly have received a fatal shock. The defendant had said that there would be no harm to any one unless they climbed the wall and reached over.

Mr. H. L. Prince, mains assistant with the City Electricity Department, said that he found that the fence was insulated from earth and connected by an insulated cable to heating apparatus in the house. He drew a fuse and cut off the supply.

The prosecuting solicitor said that further evidence would have to be obtained and asked for an adjournment *sine die*. This was granted.

Fatalities

At Falkirk an inquiry was recently held into the death of a Bo'ness workman who was killed in the works of Muirhead & Sons, timber merchants, Grangemouth. A labourer stated that along with the deceased he went into a disused shed to shelter from the rain. While in the shed witness saw deceased go towards an old switch or some other original electric wiring. They were in the shed about two minutes when witness heard deceased shout. He had hold of a wire. Witness made a grab at him and got a shock as well. The current had to be switched off before deceased could be released.

Robert Thomson, engineer, Grangemouth, said that in the shed he found three wires. One of them was bare for about three-quarters of an inch. The other two wires were covered with insulating tape. A section of insulating tape was picked up from the floor below the wire. It might have been deceased who took off the tape, but this could not be proved. Witness never had any complaint before that about the wires having been interfered with. The electrical equipment was inspected about once a month. James Wilson, foreman engineer, who had charge of the electrical apparatus, said a machine in the shed had been removed previously. The wires, part of a 400-V circuit, were cut and the ends covered with insulating tape. On the morning in question it was found that a part of the tape had been removed from one of the wires. He had seen the wires about a month before. A verdict in accordance with the evidence was returned.

An inquest was held recently at Preston on a young woman who was found lying on an electric iron plugged into the bathroom light. One witness, Stephen Carroll, electrical engineer, said the iron was faulty through remaining in a damp atmosphere for a long time. One of the wires was making metal to metal contact with the iron's framework. The connection with the bathroom light was not earthed. Further, the bathroom light wires were connected the reverse way. The coroner, in returning a verdict of "Misadventure," said it was natural for the housewife to think everything safe, when the light switch was off, but apparently it was not so in this case.

Unguarded Machine Claim

Damages of £455 were awarded at Liverpool Assizes last week against the Mersey Cable Works, Ltd., of Bootle, in favour of an 18-year-old girl who sustained injuries whilst at work. Her hand was caught in the gear of a machine which had been left unguarded.

Scottish Electricians' Wages

Owing to the late issue of the *Ministry of Labour Gazette*, the Electrical Trades Union agreed with the Electrical Contractors' Association of Scotland to accept the last three available figures in May for the purpose of determining the rate of wages of its members from June 1st onwards. These figures do not necessitate any variation, so that the rate remains at 1s. 10½d. per hour.

Refusal to Work

An electrician, W. Neil, was fined £3 at the Edinburgh Sheriff Court on June 24th for refusing to comply with an order from the Ministry of Labour to proceed to the North of Scotland to take up work there. It was stated that Neil had appealed against the order but had been unsuccessful. He pleaded that his wife was in hospital and that when he left the job there was no work there for him at that time, but the Sheriff said that this could not be accepted as an excuse. In future cases of the kind the delinquents would be sent to prison.

Appeal for Bombed Towns

Aid for the ten towns which have suffered most by enemy action is planned by Mr. George Formby, the comedian. He is giving the receipts of his performances in the towns selected to a fund which he hopes will reach a total of £50,000 and asks people to send a 1s. subscription to him c/o. the B.B.C., London.

New American Standards

Copies of proposed American standards (published for trial and criticism) in respect of AC power circuit-breakers, apparatus bushings, protector tubes and steatite insulation may be inspected free of charge at the offices of the British Standards Institution, 28, Victoria Street, London, S.W.1, where a complete set of all official Empire and foreign standard specifications is on file.

Aluminium Manufacture in Australia

The Canberra correspondent of *The Times* reports that Senator McBride, Minister of Supply, Development, and Munitions, has announced the Australian Government's decision to manufacture ingot aluminium from Australian bauxite, of which there are large deposits in New South Wales, Queensland and Victoria, which can be treated economically. The initial cost of the plant and equipment is £A.1,500,000, apart from the provision of electric power, of which more than 20,000 HP is required annually for smelting. Rolling mills are already available, and an extension plant is being installed at the works at Sydney of the Australian Aluminium Co. to make alloys of aluminium from magnesium—which will be produced in Australia before the end of the year—and also of copper. A factory for the manufacture of aluminium from bauxite and a smeltery will be built.

Electric Potato Bar

A potato bar is to be run by the Salisbury Electricity Co., in conjunction with the Ministry of Food at Electric House, Salisbury, for one week, commencing July 10th.

Changes of Address

The Bristol branch of the Metropolitan-Vickers Electrical Co., Ltd., is now at 78, Downs Park East, Bristol, 6 (telephone nos. 68051/2).

The head office and Southern Branch of the Coal Utilisation Joint Council has been transferred to 54, Victoria Street, London, S.W.1 (telephone : Victoria 9851).

Barimar, Ltd., announce that they are again in full production in another factory. The company's new office address is Kent House, 22-24, Peterborough Road, Fulham, London, S.W.6 (telephone: Renown 2147).

Trade Announcement

Mr. G. V. Downer, founder and former managing director of G.V.D. Illuminators, Ltd., now in voluntary liquidation, is carrying on the work of lighting consultant in his own name at 29, Torrington Square, W.C.1. He is the owner of the patents under which the company was licensed and he has acquired the goodwill and stock of the company.

Catalogue

British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.—Priced leaflet (L714/m) descriptive of "Mazdalux" translucent shades (not glass) for industrial lighting.

Incendiary Bomb Detectors

Means of automatically detecting incendiary bombs are being officially specified. BS/ARP. 53 is concerned with detectors of the heat-

(*Continued on page* 797)

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

Window cleaning machine
INCENDALARM fire warning system
DECORONA lamp standards

TRADE MARK APPLICATIONS

The following are among recent applications for trade marks. Objections can be made within one month of June 24th :—

Eureka. Class 9. No. 613,712. Wire for electrical purposes, but not including uncovered copper nickel electric resistance wire. —London Electric Wire Co. & Smiths, Ltd., 24, Queen Anne's Gate, London, S.W.1.

Audifrex, Class 9. No. 614,524, and **Radifrex,** Class 9. No. 614,526, Electric cables and electric wire. **Audifrex,** Class 17, No. 614,525, and **Radifrex,** Class 17, No. 614,527, Electric insulating materials, electric insulators, insulating tubing and sleeving, and parts of electrical apparatus made of insulating material.—British Insulated Cables, Ltd., Prescot, Lancs.

sensitive type, while BS/ARP.55 relates to those that rupture by impact "closed" electrical circuits, which cause bells or other alarms to be sounded. Systems of this sort are stated to be primarily intended for such buildings as dwelling houses and small industrial or commercial premises. The guard wires must break, not merely stretch, when hit by a falling bomb; therefore full directions are included for their spacing and arrangement beside specifying their mechanical properties. Plain soft copper wire is definitely unsuitable, but hard drawn wire of from 28 to 32 SWG will satisfy the prescribed tests. Details are also given of suitable relays and appropriate circuit diagrams. Copies can be purchased for 6d. each, post free, from the British Standards Association, 28, Victoria Street, London, S.W.1.

Hardy Portable Tools

A shipment of Black & Decker portable electric tools was recently bound for an export market in a cargo vessel that was attacked by the enemy. Badly crippled, but still afloat, the ship reached port with her holds awash, her cargo damaged but still intact. The tools had been under water in the hold for many days, and, when they were unloaded, water cascaded from the cases. Naturally, when they were inspected it was thought very improbable that the electric motors would be of any use. This scepticism proved to be unfounded, for after the tools were dismantled, although water was still left in the gear cases the armatures and fields, when cleaned, passed the usual flash test (1,000 V) given at the works.

Companies to be Struck Off Register

The following companies will be struck off the Register at the expiration of three months from June 27th unless cause is shown to the contrary :—P.S.R. Lamp Co., Ltd. ; Stoffels Electric Switch Co., Ltd. ; Supreme Power Co., Ltd. ; and Vita-Rays, Ltd.

Metal Rectifier Pamphlets

The principles of many communication engineering circuits in which metal rectifiers are incorporated, are described technically in the fourth edition of an illustrated 44-page pamphlet (No. 11 H) just issued by the Westinghouse Brake and Signal Co., Ltd., Pew Hill House, Chippenham, Wilts. Such applications as happen to be current British P.O. practice are indicated, together with the possibility in many cases of replacing thermionic valve rectifiers and motor generators and thus reducing maintenance and renewal costs in respect of furnishing power for operating telephone, telegraph and radio equipment.

A similarly 19-page technical pamphlet (No. 11m) that has reached its second edition, treats of auto-static means of single- to three-phase conversion, in complete contrast to machine methods or mere phase splitting.

United States Electrical Exports

The *Electrical World* states that foreign shipments of radio equipment were declared at $1,705,597, against $1,793,953 in January. Shipments abroad of rubber covered wire were valued at $254,417, against $410,026 in January. Exports of other insulated copper wire were valued at $562,332, against $506,715.

Sales of electric household refrigerators to foreign customers were declared at $696,663 in February, against $560,423 the previous month. Sales of electric refrigerator parts totalled $363,583, against $297,625.

ELECTRICITY SUPPLY

Price Reductions at Dundee. Increases at Leeds.

Brentwood.—SHELTER INSTALLATIONS.—The Urban District Council is to have electric power points installed in shelters.

Chester.—SHELTER LIGHTING.—The Corporation Emergency Committee has obtained sanction to provide lighting at 162 communal shelters at a cost of £2,252. The controller submitted a report by the shelter marshal upon the inquiries he had made with regard to the lighting of various shelters in which he recommended that mains lighting was by far the best in basement and surface shelters. In the case of trench shelters lamps were most suitable as many of the shelters were abused by the public and in many cases broken into by adults, and if mains lighting were used it would probably be damaged and rendered dangerous or unserviceable.

Dundee. — PRICE REDUCTIONS. — It is proposed to reduce the charge for lighting from 3½d. to 2⅞d. per kWh ; small power usage from 1⅜d. to 1¼d. ; and automatic meters from 3⅞d. to 2⅛d.,with proportional decreases in industrial and traction power.

Glasgow.—HOSPITAL SUPPLY.—The Corporation Sub-Committee on Mental Services has approved a suggestion by the city engineer for the installation of two electrode steam boilers and necessary switchgear to link up with the existing steam mains and supply services required for heating and hot water supply to the hospital solarium and workshop blocks at Hawkhead Mental Hospital at a total estimated cost of £4,465, and has instructed the city engineer to proceed with the work.

Leeds.—DEARER ELECTRICITY.—As from August 31st power charges will be increased by 0.006d. per kWh for each 6d. a ton increase in the basic price of 13s. a ton in the cost of coal to the Electricity Dept. The special charge for electricity used for electric welding is to be abolished and the charges for domestic purposes on the rateable value system are to be revised. The 10 per cent. discount allowed in the summer quarters to heating consumers will be abolished.

London.—HACKNEY.—The Borough Council has received the consent of the Electricity Commissioners and of the Treasury to the borrowing of £1,500 for the provision of AC meters. The Commissioners have stipulated that the consent is issued on the understanding that it will only be utilised to cover expenditure on works of pressing necessity, either for reasons of public need or on account of war requirements.

WANDSWORTH.—The Lighting Committee of the Borough Council has approved proposals submitted by the County of London Electric Supply Co., Ltd., for laying underground electric cables.

Oxford.—NEW CABLES.—The Town Council proposes the installation of cables and switchgear at an estimated cost of £3,700.

Shipley.—PROPOSED INCREASED CHARGES.—The U.D.C. Electricity Committee is to seek the views of the Electricity Commissioners upon the question of increasing charges.

LOAN FOR MAINS.—The Committee is seeking sanction to borrow £3,000 for mains and services.

RATE FUND CONTRIBUTION. — The net profit of £989 for the year is to be transferred to the general rate fund.

Wigan.—SCHOOL INSTALLATION.—The Education Committee proposes to have electric lighting installed in St. Patrick's R.C. Schools.

Overseas

Eire.—CLONSAST BOG SCHEME.—A new development in connection with the Electricity Supply Board generating station that will be erected on the Barrow, near Portarlington, is officially announced. The Government has made an Emergency Powers Order giving the Minister for Industry and Commerce power to authorise the Turf Development Board and the E.S.B. to construct a railway along any route approved of by him. The Minister has accordingly empowered the Boards mentioned to build a light railway connecting Clonsast Bog with the Great Southern Railway main system.

The Turf Development Board has a scheme in hand for the utilisation of six turf-cutting machines on the bog. Each of these machines will be capable, in full production, of an output of 20,000 tons of turf yearly. This output is intended for use at the E.S.B. station on the Barrow river. While that work is being completed the turf will be sold for domestic use as well as to industrial enterprises.

WARNING TO CONSUMERS.—The joint warning issued some time ago by the Electricity Supply Board and the Alliance and Dublin Gas Consumers' Co. has had no perceptible effect on users, and as a consequence a final notice to gas and electricity users has been published in the Press warning the public that if the needful economy is not practised at once compulsory restriction will be introduced. The notice states that despite appeals consumption has increased beyond the normal amount. The position is now serious and every consumer must reduce consumption by at least one quarter. Detailed instructions are given for economising in consumption.

United States.—CENTRAL VALLEY SCHEME.—The plan of Mr. H. Ickes to build the Central Valley project into a competitive public power development has received a set-back by the refusal of the House Appropriations Committee to accede to the Interior Department's request for $4,000,000 to commence work on a 150,000 kW steam generating plant which will ultimately cost $15 millions. The *Electrical World* states that in reporting the Bill, the Committee says that the main purpose of the Central Valley scheme as originally authorised was for reclamation and flood control and other development must be regarded as of secondary importance. Also, the steam plant is the first departure from water power development contemplated in connection with a reclamation scheme.

The Committee has allowed the increased funds sought for speeding up construction of the Shasta dam, the second largest in the world, to bring it into operation a year earlier than scheduled, and to start work on the Keswick dam. The total allowed was $34,750,000. It has also authorised $5,000,000 to start the proposed Bullshead hydro-electric scheme, which will ultimately cost $41 millions.

TRANSPORT

Blackpool.—TRAM EXTENSION TO BE CONSIDERED.—An extension of the tram service at South Shore to the Half Way House, as a help towards relieving Blackpool's traffic problems is to be reviewed by the Corporation Transport Committee. The manager, Mr. W. Luff, states that it would not be an expensive proposition for there is a good stock of tramlines on hand. Buses could then be released for other essential services, and petrol consumption would be saved.

London.—HACKNEY.—The Borough Council Works Committee has recommended that the offer of Ernest Knifton, Ltd., amounting to £33,374, be accepted for removing further tramway rails in certain highways, and that of Highways Construction, Ltd., and the Limmer Lake Asphalt Co., Ltd., for £24,836 for asphalting work for the same highways. The Committee also recommends that a contract be entered into with the British Iron & Steel Corporation (Scrap), Ltd., for the sale to it of the steel reclaimed this year at £8 per ton.

RADIO AND TELEPHONY

United States.—TELEPHONE EXCHANGES ON ELECTRIC TRAMWAYS.—The *Journal des Télécommunications*, in a review of the progress made in connection with telephonic communication during last year, mentions an innovation in San Francisco. In this city most of the electric tramways have been provided with telephone boxes from which passengers while travelling can be connected up to any subscriber on the telephone system. The new service is stated to be proving very successful.

Spain.—RADIO-TELEPHONE COMMUNICATION TO AMERICA.—According to the *Bell Telephone Quarterly*, telephone communication between Spain and America, which was suspended at the beginning of the Spanish Civil War in 1936 has recently been re-established by the provision of a short-wave radio service between New York and Madrid through which communication is also being given to Portugal.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

21607. "Telecommunication systems." Standard Telephones & Cables, Ltd., and E. P. G. Wright. July 25th, 1939. (537001.)

22203. "Tariff charging apparatus for prepayment mechanism with variable velocity ratio gearing." Landis & Gyr Akt.-Ges. August 5th, 1938. (537002.)

24728. "Electrical relay arrangements." Sangamo Weston, Ltd. March 10th, 1939. (537005.)

25036. "Voice translating microphones." E. H. Greibach. August 31st, 1939. (536969.)

25347. "Plastic mouldings for the emission of luminescence or the energy of X-rays or other rays of ultra short-wave length." I. Baldwin and I. McNeil. September 13th, 1938. (537007.)

25863. "Press button operated tuning devices for radio receiving apparatus." Fabbrica Italiana Magneti Marelli. September 16th, 1938. (Cognate application, 25864/39.) (537008.)

27589. "Absorption refrigerating apparatus." Hoover, Ltd. October 10th, 1938. (536971.)

29247. "X-ray tubes." T. E. Allibone and Metropolitan-Vickers Electrical Co., Ltd. November 2nd, 1939. (536941.)

29360. "Electromagnetic testing instruments." Sir T. G. Wrightson, R. H. Warriner and Head, Wrightson & Co., Ltd. November 3rd, 1939. (536973.)

29369. "Compounds of rubber and wax or the like." British Insulated Cables, Ltd., H. B. Chapman and W. Evans. November 4th, 1939. (537013.)

29876. "Holding device for the suspension of articles such as sheets during pickling." Birmingham Electric Furnaces, Ltd., and A. G. Lobley. November 11th, 1939. (537038.)

30199. "Electric secondary cells." L. Fuller and E. W. Sudlow. November 16th, 1939. (537072.)

30907. "Centrifugal pumps." H. E. La Bour. November 27th, 1939. (537015.)

30927. "Means for applying metal binding strips, tapes or the like." M. W. Rich. November 28th, 1939. (536944.)

30945. "Thermo-electric control devices." British Thomson-Houston Co., Ltd. November 29th, 1938. (536976.)

30962. "Automatically variable torque convertors." H. F. Hobbs. November 28th, 1939. (Cognate application, 3583/40.) (536977.)

30969. "Telephone systems." Telephone Manufacturing Co., Ltd., and L. H. Paddle. November 28th, 1939. (536945.)

31056. "Electric vacuum cleaner in which the motor fan set is supported at its two ends in the vacuum cleaner housing." Van Der Heem N.V. December 9th, 1938. (537016.)

31149. "Exciter field control in dynamo-electric generators." J. Stone & Co., Ltd., and L. R. Nixon. November 30th, 1939. (536947.)

31164. "Control devices for railway signalling systems." A. V. Tomlinson (Union Switch & Signal Co.) November 30th, 1939. (537019.)

31247. "Phase-shifting networks particularly applicable to radio guiding systems." Standard Telephones & Cables, Ltd., and W. L. McPherson. December 1st, 1939. (536950.)

31303. "Steam boiler plant." British Boiler Accessories, Ltd., and W. Goldstern. December 1st, 1939. (Addition to 513240.) (536981.)

31458. "Apparatus for producing amplitude modulated waves in radio transmitters." Soc. Française Radio-Electrique. December 2nd, 1938. (Cognate applications, 31459/39 and 31460/39.) (537076.)

31528. "Tube groups or sections more especially for steam generators." Sulzer Frères Soc. Anon. March 23rd, 1939. (537043.)

31538. "Engine starter." F. B. Dehn. (Briggs & Stratton Corporation). December 5th, 1939. (537044.)

31582. "Gas turbine installations." Sulzer Frères Soc. Anon. December 13th, 1938. (537077.)

32056. "Electricity and other meters." J. S. Highfield. December 12th, 1939. (537047.)

1940

210. "Line identification for telephone systems." Automatic Telephone & Electric Co., Ltd., R. Taylor and G. T. Baker. January 4th, 1940. (537050.)

663. "Electric battery torches." P. Goldschmidt. January 11th, 1940. (537053.)

765. "Resistance capacity elements." Marconi's Wireless Telegraph Co., Ltd., C. Austin and G. B. Banks. January 12th, 1940. (537085.)

1170. "Line drop compensators." British Thomson-Houston Co., Ltd. January 19th, 1939. (537054.)

1463. "Microtelephone handsets." A. Graham & Co., Ltd., and L. W. Rabbitt. January 24th, 1940. (536962.)

1538. "Emergency electric lighting devices." J. P. Crean. January 25th, 1940. (536983.)

1921. "Multiplex telephone systems." Philips Lamps, Ltd. February 3rd, 1939. (536963.)

1931. "Electric discharge lamps." Pearce Signs, Ltd., J. H. G. Pearce and H. W. Windebank. January 31st, 1940. (536964.)

1934. "Radio navigation devices." Marconi's Wireless Telegraph Co., Ltd. January 31st, 1939. (537089.)

2220. "Electric signalling systems." Siemens Bros. & Co., Ltd., and L. Fossett. February 5th, 1940. (536984.)

2251. "Air injectors for boiler and like furnaces." A. E. Dodwell. February 6th, 1940. (536985.)

2708. "Automatic control arrangements for alternating current generators." Siemens Bros. & Co., Ltd., M. Reed and C. L. Peters. February 13th, 1940. (536987.)

2957. "Lamp housings for external illumination." R. A. Winfield, T. C. Taylor, J. Williamson and N. M. Bell. February 16th, 1940. (Cognate application, 10512/40.) (536989.)

3070. "Multiplex telephony systems." Philips Lamps, Ltd. February 20th, 1939. (537091.)

3328. "Electric kettle." J. C. Baxter. February 22nd, 1940. (Cognate application, 11233/40.) (536990.)

3604. "Extinguishing chambers for electric circuit-breakers." Allmänna Svenska Elektriska Aktiebolaget. March 3rd, 1939. (537093.)

3651. "Trough reflector fittings for use with linear light sources." J. Studholme and Benjamin Electric, Ltd. February 28th, 1940. (536994.)

3686. "Earthing reactances." English Electric Co., Ltd., and W. E. M. Ayres, February 28th, 1940. (537059.)

3839. "Electric battery chargers and charging racks." Crypton Equipment, Ltd., and R. Squire. March 1st, 1940. (536995.)

3945. "Control of vapour arc discharge apparatus." British Thomson-Houston Co., Ltd., and J. C. Read. March 2nd, 1940. (537094.)

4366. "Joint boxes for connecting and disconnecting electric cables." Callender's Cable & Construction Co., Ltd., and W. F. Ellis. March 8th, 1940. (537096.)

4778. "X-ray localising apparatus." B. H. Crook. March 14th, 1940. (537099.)

6188. "Baking ovens, particularly ovens for baking enamel on wire." British Thomson-Houston Co., Ltd. April 5th, 1939. (537062.)

1941

3119. "Electric circuit interrupters and contacts therefor." Westinghouse Electric International Co. October 27th, 1938. (Divided out of 534979.) (537069.)

5685. "Electric secondary cells." L. Fuller and E. W. Sudlow. November 16th, 1939. (Divided out of 537072.) (537102.)

Consulting Engineers

Report for 1940-41

IN its report for the year ended April 30th last the Association of Consulting Engineers records the death of seven members and the election of thirteen new ones; the membership now stands at 153. This includes nine members serving with the forces, etc., and it has been decided that membership in such cases shall be regarded as being in abeyance and that the subscriptions shall be remitted for the year, subject to review annually. An appeal is made to members to introduce suitable candidates for election, as the war makes it more important than ever that the power and influence of the Association should be increased.

The Committee has constantly endeavoured to bring to the notice of Government Departments the importance of employing consulting engineers on public engineering works connected with the war in preference to increasing their technical staffs.

Members are again asked, in their own interests, to furnish the Association with information regarding the particular branches of engineering in which they specialise. Inquiries have been received from Government Departments, including the Treasury, as to fees under existing conditions and in reply a draft scale which is under negotiation with one of the Ministries has been quoted. It is hoped that when this scale has been finally agreed upon it will form a useful precedent. As a war measure the Committee has concurred in a special scale of fees suggested by the Minister of Works and Buildings in connection with the provision of refuge accommodation in public buildings.

During the year the President made twenty-seven nominations in response to inquiries for the services of consulting engineers (about the same as last year); these were exclusive of what are termed "wholesale" nominations in connection with war work.

The Association's financial position is stated to have deteriorated during the year. Expenditure exceeded income by £208 and this position is likely to continue. The excess of expenditure over receipts is stated to be due to the appointment of a paid secretary, increased postage, reduced sales of publications and the remission of subscriptions of members serving with the Forces. Steps are being taken to acquire more suitable office accommodation.

It has been arranged that the Association shall in future be represented only on the following Committees of the British Standards Institution:—The Electrical Industries Committee, the Building Divisional Council, the Iron and Steel Industry Committee, the Mechanical Industries Committee, and the Technical Committees on Cables, Heating and Cooking, Land Boilers and Lightning Conductors.

FINANCIAL SECTION

Company News. Liquidations and Bankruptcies. Stock Exchange Activities.

Reports and Dividends

Siemens Bros. & Co., Ltd.—The annual meeting was held on June 24th, Lord Queenborough (chairman) presiding. The statement of the chairman had been circulated with the report and accounts and was taken as read. In this the chairman said that the reduction of the profit for the year to £262,990 (against £306,234) was entirely due to the additional provision required for taxation. Expenditure on additional plant and tools throughout the year amounted to nearly £90,000, whilst depreciation written off amounted to nearly £100,000. The works had been fully occupied during the year.

The Electric Construction Co., Ltd., reports a net profit for 1940-41 of £92,264, against £57,363 in the preceding year. After providing £48,000 (against £15,000) for taxation and £2,500 (against nil) for superannuation the 10 per cent. dividend on the ordinary shares is maintained and £30,233 (against £25,459) is carried forward.

Simms Motor Units, Ltd., reports a net profit for 1940 of £32,179, as compared with £14,647 for the preceding year, out of which £20,300 is provided for taxation. It is proposed to pay a dividend of 6 per cent. on the ordinary shares (against 4 per cent.), to add £2,500 to debenture redemption reserve, and £1,978 is written off debenture issue expenses. The balance carried forward is £16,762 (against £16,111 brought in).

Cable & Wireless, Ltd., held its annual meeting on June 26th, when Sir Edward Wilshaw (chairman and managing director), who presided, said that it was not possible to estimate the company's liability to Excess Profits Tax, the determination of which depended upon the basis of assessment which might finally be applied to Cable & Wireless (Holding), Ltd. Until this question was settled no provision could be made for the amount of the tax to be apportioned to the operating company. Sir Edward expressed regret that during the past year some members of the staff had lost their lives through enemy action and paid tribute to the devotion to duty of the staff in perilous conditions at many points.

Marconi's Wireless Telegraph Co., Ltd.—Presiding at the annual meeting on June 27th Admiral H. W. Grant (chairman and managing director) said that in view of the Government's request he did not propose to go into details regarding the company's activities during the past year. He paid a tribute to the loyalty of the staff which had carried on under the difficult conditions existing during the year under review.

Whitehall Electric Investments, Ltd., reports a gross income of £231,992 for 1940–41, against £223,486 in the preceding year; the net income rose from £208,001 to £208,174. The preference dividend absorbs £187,500 and a balance of £20,674 is added to the undistributed balance, making £430,676.

The Anglo-Portuguese Telephone Co., Ltd., had a total income of £418,450 in 1940, as compared with £364,338 in 1939. The net profit increased from £81,853 to £84,882. After meeting debenture service, provision for contingencies and dividends (8 per cent. on the ordinary and "A" ordinary) a balance of £37,057 is carried forward.

The meeting is to be held on July 8th, and in a statement circulated in advance the acting chairman (Mr. A. N. Rye) refers to the absence of Sir Alexander Roger (chairman) on a Government Mission to India. The statement goes on to review the accounts and mentions that 2,325 stations were added to the system during the year, raising the total to 54,831. The company's relationships with the Portuguese authorities continue on the most friendly basis.

W. & T. Avery, Ltd., report a net profit for the year to March 31st of £130,661, as compared with £151,098 for 1939–40. The final ordinary dividend is 10 per cent., again making 15 per cent. for the year.

Hick, Hargreaves & Co., Ltd., have announced a final dividend of 5 per cent., making 7 per cent. for the year (against 5 per cent., plus a bonus of 5 per cent.).

The British Vacuum Cleaner & Engineering Co., Ltd., announces that as soon as the year's accounts are available the arrears of preference dividend will be considered. The last payment on the preference was in December, 1939; arrears thus date from January 1st, 1940.

The Rangoon Electric Tramway & Supply Co., Ltd., reports a gross profit for 1940 of £189,135, as compared with £172,404 for 1939. Fees, employees' provident fund and bonus, income tax, debenture interest, transfers to reserve, dividend on preference and interim on ordinary absorb £151,290. The final ordinary dividend is 12 annas per share, free of Burma tax, making 1 rupee per share (same), and £25,029 is carried forward (against £18,068 brought in).

The Philco Radio and Television Corporation announces that no dividend is being paid on the 6 per cent. redeemable cumulative preference shares for the past year. The dividend is now in arrear as from July 1st, 1937.

The Electric Furnace Co., Ltd., has declared a second interim dividend of 4½ per cent. (against 3½ per cent. last year).

R. B. Pullin & Co., Ltd., are maintaining their interim dividend at 5 per cent.

The Dubilier Condenser Co. (1925), Ltd., is maintaining its dividend for the year at 10 per cent.

New Companies

Great West Electrical & Winding Co., Ltd.—Private company. Registered June 14th. Capital £100. Objects: To carry on the business of electrical engineers and contractors, maintainers, repairers and re-winders of and dealers in electrical machinery, products and devices, etc. Wm. J. Jackson, 49, Francis Road, Hounslow, Middlesex, is the first director. Secretary: A. A. Chenery. Registered office: 43a, High Street, Brentford, Middlesex.

Braddon Electrical Co., Ltd.—Private company. Registered June 21st. Capital £1,000. Objects: To carry on the business of manufacturers of electrical and radio instruments and accessories, manufacturing, electrical, sanitary and general engineers, etc. Directors: J. Grant, sen., "Hillcroft," Murhill, Limpley Stoke, Bath, and four others. Registered office: 17, Silver Street, Bradford-on-Avon, Wilts.

Suter Electrical Engineering, Ltd.—Private company. Registered June 21st. Capital £2,000. Objects: To carry on the business of mechanical, electrical, general engineers, contractors, workers in metals, bakelite, resins, synthetic resins and the like, manufacturers of and dealers in apparatus for the permanent waving of the hair, etc. Subscribers: W. G. S. Ford, 23, Long Lane, Croydon, Surrey, and F. J. Stone, 29, Inchmery Road, Catford, S.E.6. Solicitors: Cardew-Smith and Ross, 27, Ely Place, E.C.1.

Warmex, Ltd.—Private company. Registered June 21st. Capital £100. Objects: To carry on the business of manufacturers of and dealers in emergency warming appliances, electrical appliances, etc. Subscribers: A. Kirschenbaum, 42, Bromehead Street, E.1, and H. Horowitz, 31, Vallance Road, E.1. Registered office: 16/17, Devonshire Square, E.C.2.

Air Heating Ltd.—Private company. Registered in Edinburgh June 16th. Capital £10,000. Objects: To carry on the business of heating engineers and manufacturers and suppliers of heating, cooling and ventilating plant of all kinds, electrical, structural and welding engineers, etc. Directors: G. Coghill, 5, Church Road, Giffnock, Glasgow, and four others. Registered office: Murray Street, Paisley.

W. C. Watson & Sons, Ltd.—Private company. Registered June 20th. Capital £100. Objects: To carry on the business of manufacturers of and dealers in wireless and television sets, accessories and apparatus, etc. Directors: W. C. Watson and Mrs. B. Watson, both of 95, Byton Avenue, N.W.10. Registered office: 159, Malvern Road, West Kilburn, N.W.6.

Glenville Instrument Co., Ltd.—Private company. Registered June 18th. Capital £3,000. Objects: To carry on the business of scientific and other instrument makers, electrical, mechanical, motor and general engineers, tool makers, manufacturers of engineering supplies, etc. Directors: E. G. Kay, 25, Aldridge Rise, New Malden, Surrey, and Mrs. Georgina Leach, 18, Cecil Road, Chadwell Heath, Essex.

Companies' Returns

Statements of Capital

F. D. Newcombe & Co., Ltd.—Capital £30,000 in £1 shares. Return dated December 31st, 1940 (filed March 10th, 1941). 27,905 shares taken up. £22,905 paid. £5,000 considered as paid. Mortgages and charges: £4,000.

A. Reyrolle & Co., Ltd.—Capital £1,250,000 in 115,000 preference, 816,711 ordinary and 318,289 unclassified shares of £1. Return dated April 23rd, 1941. 102,500 preference and 816,711 ordinary shares taken up. £875,500 paid on 102,500 preference and 773,000 ordinary shares. £43,711 considered as paid on 43,711 ordinary shares. Mortgages and charges: Nil.

British Short-Circuit Testing Station, Ltd.—Capital £10,000 in £1 shares. Return dated April 23rd, 1941. 302 shares taken up. £302 paid. Mortgages and charges: Nil.

Tolworth Electricity Co., Ltd.—Capital £1,000 in £1 shares. Return dated December 16th, 1940. All shares taken up. £501 paid (£1 on 2 and 10s. on 998 shares). Mortgages and charges: Nil.

Llanelly & District Electric Supply, Ltd.—Capital £1,400,000 in 600,000 6 per cent. cumulative preference, 600,000 ordinary and 200,000 undenominated shares of £1 each. Return dated March 28th, 1941. 600,000 preference and 600,000 ordinary shares taken up. £1,194,000 paid. £6,000 considered as paid. Mortgages and charges: Nil.

West Hampshire Electricity Co., Ltd.—Capital £250,000 in £1 shares. Return dated April 2nd, 1941. All shares taken up. £250,000 paid. Mortgages and charges: Nil.

Lancashire Electric Light & Power Co., Ltd.—Capital £4,571,415 in £571,415 1st preference stock, £1,000,000 7 per cent. preference stock, £2,900,000 ordinary stock and 100,000 unclassified shares of £1 each. Return dated April 3rd, 1941. All 1st preference, 7 per cent. preference and ordinary stock taken up. £4,469,015 paid. £2,400 considered as paid. Mortgages and charges: £1,311,277.

Lancashire Dynamo & Crypto, Ltd.—Capital £460,000 in £1 shares (400,000 ordinary and 60,000 preference). Return dated April 15th, 1941. All shares taken up. £422,508 paid. £37,492 considered as paid. Mortgages and charges: Nil.

English Electric Co., Ltd.—Capital £5,000,000 in £1,500,000 preference stock and £3,500,000 ordinary stock. Return dated March 6th, 1941. £1,135,844 preference and £1,922,513 ordinary stock issued and fully paid up. Mortgages and charges: £1,384,000.

Magna Wire & Cable Co., Ltd.—Capital £11,000 in 10,000 preference shares of £1 each and 20,000 ordinary shares of 1s. each. Return dated April 11th, 1941. 2,027 preference and 11,600 ordinary shares taken up. £2,027 paid. £580 considered as paid. Mortgages and charges: Nil.

E. P. Allam & Co., Ltd.—Capital £6,000 in £1 shares. Return dated April 18th, 1941. 5,250 shares taken up. £2 paid. £5,248 considered as paid. Mortgages and charges: Nil.

(*Continued on page* 802)

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange opinion takes the definite view that a new issue of Government borrowing, probably in the shape of National War Bonds, third series, will be announced in the fairly near future. It is just a year since the first issue of National War Bonds was made, followed by the second series—that now on tap—a few months later. In the next Government borrowing, the terms offered to money will be rather less favourable, it is generally anticipated, than those offered by the current issue and its predecessor.

In an attempt to make the best of to-day's opportunity, money is buying up gilt-edged stocks with the same sort of eagerness as its possessors strive for cigarettes and oranges. The result is to force up prices of gilt-edged stocks, and, as a natural corollary, to exert a similar influence over the ordinary shares of the best class industrial companies such as British Insulated, Callender's, Henley's, General Electric and others of similar character. Home Railway stocks continue to be steadily bought at rising prices. Cable and Wireless are somewhat disappointing to holders who expected that after publication of the figures for the year there would be a further buying movement. This, however, has not yet materialised.

Electricity Supply

So far from the market for electricity supply shares being unfavourably affected by the prospect of utility services being rationed, the opposite has been the case. Nominally the official prices show little alteration, but, actually, when the prospective buyer wants to pick up shares, he will find the prices are what the Stock Exchange calls better than they look. The seller, on the other hand, will be agreeably surprised to find how good are the prices which he will obtain in to-day's market for the shares. The strength of the group is well distributed. Prejudice that existed for a time against investment in shares of the London companies has been dispersed by the urge to acquire shares in an industry which, after the war at any rate, is regarded as sure to go ahead rapidly and consistently.

Price Fluctuations

Half-a-dozen prices in the market for Home Electricity Supply companies are 6d. to 1s. 3d. better on the week. County of London at 31s. 3d., and Bournemouth and Poole at 47s. 6d. are 1s. 3d. up. There has been a little demand for some of the Canadian utility shares: Montreal Power and Shawinigan are both higher on balance. The principal rise amongst equipment and manufacturing issues was secured by Automatic Telephone shares, where not much more than a slight pressure to buy served to put up the price to 45s. Last week's improvement of 5s. in International Combustion shares has been followed by a further improvement of 1s. 8d. to £5. Callender's, Crabtree, Henley's, Johnson & Phillips and Tube Investments, are all $\frac{1}{16}$ better. Electric & Musical Instruments retain their recent sharp gain at 10s. 6d. The British Vacuum Cleaner Co. will consider the question of preference dividend arrears as soon as the accounts are available. The ordinary are quoted at 6s. 3d. and the 5½ per cent. preference at 12s. 6d.

Shares on Offer

Edmundsons ordinary can be bought, perhaps, in a line of 5,000 shares at 26s. 3d. ex dividend, to return £4 11s. 3d. and 10,000 Lancashire Electric Light & Power ordinary have been on offer at 32s., yielding £4 13s. 9d. on the basis of the 7½ per cent. dividend paid in each of the past four years. One thousand each of British Power & Light at 25s., Electric Supply Corporation at 40s. 6d. and Northmet Power ordinary at 29s. 6d., will give an average return of a shade over 4½ per cent. on the money. Market Drayton Electric Light & Power ordinary shares came on offer at 29s. The company usually pays its dividend once a year and free of income tax. In each of the past two years the dividend was 5 per cent., following two years at 6 per cent. The 5 per cent. tax-free dividend gives a return, at 29s., of £3 9s. 0d. per cent., equivalent to £6 18s. 0d. per cent., taking tax at 10s. in the £. It seems hardly necessary to point out that in the shares of the lesser-known electricity supply companies the market is more limited than that which obtains in the case of the more familiar shares.

Home Railway Hopes

The Home Railway companies have announced that their dividend declarations will all be made on July 25th, instead of their coming, as they did in pre-war times, at various dates spread over a fortnight. In the market it is considered practically certain that the dividends for the half-year ended June 30th will be at the same rates as those of twelve months ago. Transport " C " is expected to receive 15s. per cent.; Southern preferred the full 2½ per cent. to which it is entitled. Expectation still looks with interest for the long-overdue announcement that will formulate the new agreement between the Government and the railway companies. Inquiry in the Stock Exchange market shows that the Home Railway dealers take a philosophic view of the outlook, in that they assume the Government's decision, when formulated, will have little effect upon prices unless, of course, that decision should spring an unpleasant surprise.

Rising Prices

Transport " C " has risen 2 to 36, making a rise of 8 points in three weeks. If the dividend for the present year is maintained at 3 per cent., the yield at this price will still be 8½ per cent. on the money. Southern preferred has gone up to 4½, and a 5 per cent. dividend for the year will give a yield of over 9 per cent. on the money. Investment and speculative investment are turning towards Home Railway stocks as offering scope for appreciation in price. People who refused, almost contemptuously, to look at Home Rails when prices were low a month ago, are now asking their brokers for suggestions for the purchase of stock which is likely to prove satisfactory from the point of view of yield and increased value.

Revo Electric

Explanation of the reason which has for some time past left the price of Revo standing at a level that returned no more than 2¼ per cent. on the money, is to be found in the company's dividend announcement making a total of 20 per cent. for the year ended last March. The company's net profit went up by £19,000. For the year 1939–40, the dividend was 5 per cent., comparing with 17½ per cent. in the previous year, so that the present statement shows an improvement from that of two years ago. The company manufactures traffic control equipment, electrical fittings, cookers and other domestic appliances. For some time past it looked as though the price were being maintained at a fictitious level, having regard to the last-paid modest dividend, but the latest results show the confidence of shareholders in the company to be well justified. The yield, in our last week's table of £2 2s. 1d. per cent., goes up to 8 per cent. on the basis of the 20 per cent. dividend just declared.

General Electrics

On the eve of the dividend announcement, General Electric ordinary shares remained a steady market at 83s. 9d. Last year the dividend announcement came on July 5th, but the market is looking for the declaration to be made on any day, and it may be published before this issue of the ELECTRICAL REVIEW. It is so much taken for granted that the dividend will be maintained at 20 per cent., that investment has been steadily taking the shares on the assumption that at 83s. 9d. cum. dividend, the yield will be nearly 5 per cent. on the money. The General Electric board has frequently been asked to pay dividends twice a year, but up to the present the company's traditional practice of distributing profits only once a year has been carried on.

Cable & Wireless

Cable & Wireless (Holding) Co., Ltd., held its meeting on Monday in this week, following upon the meeting of the Cable and Wireless operating company last Friday. The chairman of the Holding Company's review of the position had already been circulated, and the meeting added little more to the stock of knowledge available from the report. The business of the company would appear to be making satisfactory progress, considering all things, and the depreciation in the balance-sheet will probably be recovered in due course. The price of the ordinary stock has gone back to 61, realisations being stimulated, it would seem, by a misconception which arose in connection with the two undertakings. Some critics failed to draw the necessary distinction, which would show that the Holding Company is in a good financial position and that the prospects of the 4 per cent. dividend being maintained throughout the war are, so far as can be seen, distinctly promising.

I.T.T.

Nowadays there is so little attention paid to shares of the International Telephone & Telegraph Corporation that the figures relating to the revenues in 1940 aroused little interest. The company received $26 millions as operating revenue and rather over $1¼ millions in other income. The net loss on the year, however, came to $162,000, against a profit in the previous year of $2,856,911. The price of the shares is about $3 and shares seldom change hands on this side. The last recorded bargain in the Stock Exchange market was at 2$\frac{5}{16}$ on May 19th this year.

Electric Tanker Record

A SHIPBUILDING record was claimed in America when the oil tanker *E. H. Blum* sailed one day less than six months after her keel was laid in the Chester yards of the Sun Shipbuilding and Dry Dock Co., U.S.A., which built the vessel for the Atlantic Refining Co. The ship is not only of all-welded construction, being 544 ft. long overall with an oil cargo capacity of 154,000 barrels, but is also propelled by steam turbo-electric plant of 5,000 HP, which gives her a service speed of 13.25 knots.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1941 Highest	1941 Lowest	Dividend Previous	Dividend Last	Middle Price June 30	Rise or Fall	Yield £ s. d.
Home Electricity Companies							
Bournemouth and Poole	48/6	45/–	15	12½	47/6	+⅛	5 5 3
British Power and Light	27/9	23/–	7	6	24/6	..	4 18 0
City of London	22/6	20/–	7½	7	22/–	+9d.	6 7 3
Clyde Valley	36/6	33/6	8	8	34/6	..	4 12 9
County of London	34/6	30/–	10½	8	31/3	+⅛	5 2 5
Edmundson's:							
7% Pref.	31/–	25/6	7	7	30/9	..	4 11 1
Ord.	26/–	23/6	6	6	26/–	..	4 12 4
Elec. Dis. Yorkshire	39/–	36/–	9	9	38/9	..	4 12 9
Elec. Fin. and Securities	42/6	39/–	12½	12½	42/6	..	5 17 8
Elec. Supply Corporation	39/–	36/–	11½	10	38/9	..	5 3 3
Isle of Thanet	8/–	6/–	2	Nil	7/6	..	—
Lancs Light and Power	31/6	28/6	7½	7½	31/3	..	4 16 0
Llanelly Elec.	21/–	19/6	5½	5½	20/–	..	5 10 0
Lond. Assoc. Electric	16/6	12/6	5½	4½	15/9	+9d.	5 14 3
London Electric	23/6	21/3	7	7	22/6	..	6 4 5
London Power Deb. Red	103½	102	5	5	103	..	4 17 1
Metropolitan	34/6	31/–	10	8	32/6	+6d.	4 18 6
Midland Counties	36/–	32/9	8	8	35/9	+9d.	4 9 5
Mid. Elec. Power	35/–	33/3	9	9	35/–	..	5 2 10
Newcastle Elec.	26/3	24/6	7	7	25/–	..	5 12 0
North Eastern Elec.:							
Ordinary	29/–	25/6	7	7	27/6	..	5 1 10
7% Pref.	32/6	29/–	7	7	32/6	..	4 6 2
Northampton	2⅛	39/6	10	10	41/3	..	4 17 0
Notting Hill 6% Pref.(£10)	9	8	6	6	8½	..	—
Northmet Power:							
Ordinary	34/6	28/6	10	7	28/9	..	4 17 4
6% Pref.	29/6	27/3	6	6	29/6	..	4 1 4
Richmond Elec.	20/–	18/–	6	6	18/9	..	6 8 0
Scottish Power	36/6	33/–	8	8	36/3	..	4 8 5
Southern Areas	16/6	14/6	5	5	16/3	..	6 3 0
South London	20/–	19/3	7	7	20/–	..	7 0 0
West Devon	21/6	20/9	5	5	21/3	..	4 14 1
West Glos.	18/3	17/3	4½	4½	17/6	..	5 2 10
Yorkshire Elec.	38/3	34/6	8	8	38/3	..	4 4 0
Overseas Electricity Companies							
Atlas Elec.	2/6	1/6	Nil	Nil	2/–	..	—
Calcutta Elec.	37/3	33/–	8*	7*	35/6	..	3 19 0
Cawnpore Elec.	30/–	26/–	10	10	28/9	..	7 5 9
East African Power	25/6	21/6	7	7	25/–	..	5 12 0
Jerusalem Elec.	22/6	18/6	7	7	18/9	..	7 9 4
Kalgoorlie (10/–)	12/6	11/–	7½	7½	12/6	..	6 0 0
Madras Elec.	25/3	23/6	8*	6*	23/9	..	—
Montreal Power	31	24	1½	1½	24½	+½	6 2 5
Palestine Elec. "A"	20/6	14/–	Nil	Nil	14/6	..	—
Perak Hydro-electric	18/3	16/3	2½	6	16/3	..	7 7 8
Shawinigan Power	18½	14	83cts.	90cts.	16⅛	+⅛	—
Tokyo Elec. 6%	40½	33	6	6	33½	..	17 18 0
Victoria Falls Power	76/6	69/6	15	15	76/3	..	3 18 6
Whitehall Investment Pref.	14/9	8/3	7½	7½	10/–	..	15 0 0
Public Boards							
Central Electricity:							
1950–70	110½	108	5	5	110½	..	4 10 6
1955–75	113½	109½	5	5	113	..	4 8 6
1951–73	108	105½	4½	4½	107	..	4 4 1
1963–93	101	94	3½	3½	100	..	3 10 0
1974–94	94	87⅜	3½	3½	94	..	3 9 2
London Elec. Trans. Ltd.	94	91½	2½	2½	94	..	2 13 2
London & Home Counties 1955–75	108	106	4½	4½	108	..	4 3 4
Lond. Passenger Transport:							
A	120	109	4½	4½	113½	−2	3 19 4
B	114	102½	5	5	109½	−1	4 11 4
C	36	29	1½	3	36	+2	8 6 8
West Midlands Joint Elec. 1948–68	108½	103	5	5	108½	..	4 12 0
Telegraph and Telephone							
Anglo-Am. Tel:							
Pref.	103½	99	6	6	103½	..	5 16 1
Def.	24	21	1½	1½	22½	..	6 13 4
Anglo-Portuguese	17/6	12/6	8	8	12/6	..	12 16 0
Cable & Wireless:							
5½% Pref.	102	93	4½	5½	100	..	5 10 0
Ord.	68	52½	4	4	61	−2	6 11 2
Canadian Marconi $1	5/–	4/–	Nil	4cts.	5/3	..	3 4 0
Globe Tel. & Tel.:							
Ord.	29/–	26/–	7½*	6*	27/6	..	4 7 3
Pref.	28/–	25/–	6	6	27/6	..	4 7 3
Great Northern Tel. (£10)	14	10½	20	20	12½	..	—
Inter. Tel. & Tel.	3½	2½	Nil	Nil	3	..	—
Marconi-Marine	25/–	19/9	7½	7½	25/–	..	6 3 0
Oriental Telephone Ord.	56/6	47/–	12*	11½*	2⅛	..	4 1 10
Telephone Props.	11/6	11/–	6	6	11/3	..	10 13 4
Telephone Rental (5/–)	7/9	6/9	10	10	7/3	..	6 18 0

Company	1941 Highest	1941 Lowest	Dividend Previous	Dividend Last	Middle Price June 30	Rise or Fall	Yield £ s. d.
Traction and Transport							
Anglo. Arg. Trams:							
First Pref. (£5)	2/3	1/–	Nil	Nil	2/–	..	—
4% Inc.	8½	4	Nil	Nil	6	..	—
British Electric Traction:							
Def. Ord.	830	740	45	45	800	..	5 12 6
Pref. Ord.	167	150	8	8	160	..	5 0 0
Bristol Trams	40/–	36/–	8*	8	36/3	..	4 8 5
Brazil Traction	8	6½	$1	50c.	7½	..	—
Calcutta Trams	19/9	18/–	8	5½	18/–	..	6 2 3
Cape Elec. Trams	17/6	16/6	5	5	17/–	..	5 17 4
Lancs Transport	39/9	36/–	10	10	38/9	..	5 3 1
Mexican Light:							
1st Bonds	40	34½	5	5	40	..	—
Rio 5% Bonds	85½	82½	5	5	85	..	5 17 8
Southern Rly.:							
5% Prefd.	55	43½	5	5	54½	+2	9 3 6
5% Pref.	96	77½	5	5	95½	+1½	5 4 9
T. Tilling	44/–	34/6	10	10	43/9	..	4 11 4
Tilling & B.A.	48/–	45/6	8*	7*	47/6	+1/9	2 19 0
West Riding	38/–	34/–	10	10	38/–	..	5 5 4
Equipment and Manufacturing							
Aron Electricity Ord.	18/6	16/–	15	Nil	18/–	..	—
Assoc. Elec.:							
Ord.	42/6	38/3	10	10	42/6	..	4 14 3
Pref.	36/–	33/3	8	8	35/–	..	4 11 5
Automatic Telephone & El.	47/3	32/–	12½	12½	45/–	+⅛	5 11 1
Babcock & Wilcox	44/–	39/–	11	11	43/9	+⅛	5 0 6
British Aluminium	44/–	39/–	12½	10	43/9	+⅛	4 11 4
British Insulated Ord.	88/3	78/9	20	20	85/–	+⅛	4 14 1
British Thermostat (5/–)	12/6	10/6	18½	18½	12/6	..	7 8 0
British Vacuum Cleaner(5/–	6/3	6/–	40	12½	6/3	..	10 0 0
Brush Ord.	4/3	3/6	Nil	Nil	3/9	..	—
Callender's	65/6	58/6	15	15	65/–	+⅛	4 12 4
Chloride Elec. Storage	63/6	60/–	15	15	62/6xd.	+1/–	4 15 10
Consolidated Signal	65/–	60/–	17	17	62/6	..	5 8 7
Crabtree (10/–)	25/–	21/3	17½	17½	25/–	+⅛	7 0 0
Crompton Parkinson:							
Ord. (5/–)	19/–	17/9	30	20	18/9	..	5 6 8
E. K. Cole (5/–)	7/–	2/9	10	Nil	6/9	+⅛	—
Elec. & Musical Industries (10/–)	11/–	7/3	5	Nil	10/6	..	—
Electric Construction	30/–	25/–	13½	10	28/9	..	6 19 0
Enfield Cable Ord.	51/–	45/–	16½	12½	45/–	..	5 11 3
Electrical Switchgear (10/–)	22/6	20/–	16	10	20/–	..	5 0 0
English Electric	35/–	29/–	10	10	35/–	..	5 14 2
Ensign Lamps (5/–)	16/3	15/–	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)	37/3	35/–	25*	22*	35/–	..	3 2 10
Ever Ready (5/–)	27/6	25/–	40	40	27/6	..	7 5 6
Falk Stadelmann	16/9	13/9	6	7	15/9	..	8 17 10
Ferranti Pref.	25/6	23/6	7	7	25/–	..	5 12 0
G.E.C.							
Pref.	33/–	30/6	6½	6½	32/6	..	4 0 0
Ord.	84/–	77/–	20	20	83/9	..	4 15 8
Greenwood & Batley	21/–	18/6	15	13	20/–	..	13 0 0
Hall Telephone (10/–)	14/–	10/–	15	10	13/9	..	7 5 6
Henley's (5/–)	21/6	19/6	20	20	21/3	+⅛	4 14 1
4½% Pref.	21/6	20/–	4½	4½	21/3	..	4 4 8
Hopkinsons	45/–	37/6	15	15	44/–	..	6 16 4
India-Rubber Pref.	21/6	19/6	5½	5½	21/3	..	5 3 6
Intl. Combustion	100/–	81/3	32½	30	100/–	+½	6 0 0
J. Lucas	59/–	50/6	15	15	58/9	..	5 2 0
Johnson & Phillips	48/9	43/–	15	15	48/9	+⅛	6 3 0
Lancashire Dynamo	53/6	50/–	20	20	52/6	..	7 12 5
Laurence, Scott (5/–)	10/–	7/6	15	15	10/–	..	7 10 0
London Elec. Wire	25/6	20/–	7½	7½	22/6	..	6 13 4
Mather & Platt	40/–	32/–	13½	10	39/6	..	5 6 8
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	..	5 3 6
Murex	84/6	75/–	20	20	82/6	..	4 15 8
Pye Deferred (5/–)	11/6	10/9	25	25	11/3	..	11 2 2
Revo (10/–)	25/–	18/9	5	20	25/–	+⅛	8 0 0
Reyrolle	55/–	47/9	12½	12½	53/9	..	4 13 0
Siemens Ord.	22/9	17/–	7½*	7½	21/3	..	7 1 2
Strand Elec. (5/–)	2/–	1/–	4	2	2/–	..	5 0 0
S. Smith (1/–)	7/9	5/9	37½	50	6/3	..	8 0 0
Switchgear & Cowans (5/–)	9/–	7/3	10	15	8/9	..	8 11 6
Telegraph Condenser (10/–)	12/6	7/–	Nil	5	12/6	..	4 0 0
Telegraph Construction	40/–	34/6	10	10	40/–	..	5 0 0
Telephone Mfg. (5/–)	7/6	6/9	9	9	7/3	..	6 4 2
Tube Investments	95/–	89/–	23½	23½	93/9	+⅛	5 1 3
Vactric (5/–)	2/3	2/–	4	Nil	2/–	..	—
Vickers (10/–)	16/–	14/–	10	10	15/9	..	6 7 0
Ward & Goldstone (5/–)	19/9	12/6	20	20	16/6	..	5 19 9
Westinghouse Brake	42/6	39/6	17½	10	42/–	..	4 15 1
Walsall Conduits (4/–)	29/–	24/6	55	55	28/9	..	7 12 9
West Allen (5/–)	4/3	3/6	7½	7½	3/9	..	10 0 0

* Dividends are paid free of Income Tax.

Financial Section (*Concluded from page 799*)

Denman's Electricity, Ltd.—Capital £1,500 in 500 preference shares of £1 and 20,000 ordinary shares of 1s. Return dated March 29th, 1940 (filed April 22nd, 1941). 300 preference and 20,000 ordinary shares taken up. £300 paid on 300 preference shares. £1,000 considered as paid on 20,000 ordinary shares. Mortgages and charges: Nil.

Siemens Schuckert (Great Britain), Ltd.—Capital £30,000 in 30,000 shares of £1 each. Return dated March 26th, 1941. 29,405 shares taken up. £29,405 paid. Mortgages and charges: £9,413 13s. 11d.

Associated Utilities, Ltd.—Capital £250,000 in 200,000 ordinary and 50,000 4 per cent. cumulative preference shares of £1 each. Return dated April 3rd, 1941. 200,000 ordinary and 31,091 preference shares taken up. £231,091 paid. Mortgages and charges: £100,000.

Harries Thermionics, Ltd.—Capital £23,000 in 18,000 non-cumulative preference shares of £1 and 100,000 deferred shares of 1s. each. Return dated July 12th, 1940 (filed April 11th, 1941). 15,774 preference and 98,304 deferred shares taken up. £20,679 4s. paid on 15,774 preference and 98,104 deferred shares. £10 considered as paid on 200 deferred shares. Mortgages and charges: Nil.

Mortgages and Charges

Hants Relay, Ltd.—Satisfaction to the extent of £200 on February 28th, 1941, of series of debentures authorised by resolution dated November 8th, 1934, and registered January 21st, 1935. (Notice filed June 6th, 1941.)

Underwood (Electric), Ltd.—Assignment of moneys due under various contracts, dated May 28th, 1941, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £2,100.

Schall & Son, Ltd.—Assignment of moneys due to the company under various contracts, dated May 30th, 1941, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

North of England Engineering & Electrical Co., Ltd.—Particulars filed of £1,000 debentures authorised March 29th, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Receiver Released

General Radio & Electrical Supply Co., Ltd.—F. W. Inns of Imperial House, 80/86, Regent Street, W.1, ceased to act as receiver and/or manager on June 3rd, 1941.

Liquidation

John Leech (Electrical Contractors), Ltd.—Meetings, pursuant to section 245 of the Companies Act, 1929, on July 23rd, at 58, Theobalds Road, London, W.C.1, to receive an account of the winding-up by the liquidator, Mr. R. Langdon Davis.

Bankruptcy

W. H. Grange (Talbot Electrical Co.), electrical engineer, 14, Plumstead Road, Thorpe St. Andrew, Norfolk.—Trustee, Mr. F. R. D. Walter, Castle Chambers, Opie Street, Norwich, Official Receiver, released June 18th.

CONTRACT INFORMATION

Tenders Invited and Accepted. Schemes Promising Electrical Work.

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parenthesis.

Australia.—NEW SOUTH WALES.—August 4th. Department of Works and Local Government. 66 kV transformers for Burrinjuck electric construction. August 18th. Protective equipment for transmission lines and sub-station plant, Burrinjuck scheme. Specifications (5s.) from N.S.W. Government Offices, London.

South Africa.—DURBAN.—City Council. July 18th. 33 kV 3-phase switches and busbar supports (Contract E.2029).

PORT ELIZABETH.—City Council. July 24th. Cable, copper wire and house service cut-outs.

Orders Placed

Bournemouth. — Assistance Committee. Accepted. Stand-by supply at the Fairmile Institution (£474).—G. N. Haden & Sons.

Durham.—County Public Assistance Committee. Accepted. Revised tender for wiring air raid shelters at Sedgefield Institution (£55).—F. Warren.

County Education Committee. Accepted. Installation of electric lighting at Bearpark School, in place of tender withdrawn (£185).—T. W. Atkinson. Similar work at Sherburn School, also in place of tender withdrawn (£226).—Falconar, Cross & Co.

Glasgow.—Electricity Committee. Accepted. Six 800 kVA transformers.—British Electric Transformer Co., Ltd. (2), £1,110; Bruce Peebles & Co., Ltd. (4), £2,219.

Transport Committee. Accepted. Cable.—Scottish Cables, Ltd. (£3,972). Asbestos covered wire.—London Electric Wire Co. & Smiths, Ltd.; British Insulated Cables, Ltd.; E. & E. Kaye, Ltd. Conduit.—Simplex Electric Co., Ltd.; Walsall Conduits, Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alloa.—Works canteen; manager, Harland Engineering Co.

Ashton-under-Lyne.—Girls' club premises, Oldham Road; Mrs. J. Heselton, area organiser, National Council of Girls' Clubs.

Barnoldswick.—Conversion into flats, Bank Buildings, Skipton Road; trustees of the late Mr. H. C. Pattie.

Basford.—Feeding centres at Kimberley, Ruddington, and Selston, for R.D.C.; E. Anderton, clerk, Rock House, Stockhill Lane.

Benfleet.—Part erection of senior school (£5,000); Essex county architect.

Bingley.—Day nursery for U.D.C. Health, Maternity & Child Welfare Committee; A. O. Robinson, surveyor and architect, Town Hall.

Bournemouth.—Garage and cold store, Horsham Avenue; Malmesbury & Parsons Dairies, Ltd.

Brighouse.—Re-wiring of office, laboratory and manager's house at the sewage works, for T.C.; H. A. Sneezum, borough surveyor, Municipal Offices, Commercial Street.

Calne.—Alterations at Silver Street schoolroom for use as communal feeding centre, for T.C.; borough surveyor, Town Hall.

Chesterfield. — British Restaurant at Whittington for T.C.; W. S. Wilson, borough surveyor, Town Hall.

Darlington.—Cooking kitchens and dining centres for the T.C. (£3,800); borough engineer.

Durham.—Feeding and sleeping centres (£40,000); county architect.

Esher.—Sleeping quarters, canteen, etc., at depot premises, for U.D.C.; surveyor, Council Offices.

Farnborough.—Feeding centre at St. Mark's Rooms (£900), for U.D.C.; Surveyor's Department, Town Hall.

Fenton (Staffs.)—Canteen, Duke Street; Teddy Toy Co., Ltd.

Glasgow.—Two decontamination stations (£4,900); Hunter & Clark, Ltd.

Temporary church, Priesthill; R. C. Diocese of Glasgow.

Greenock.—Buildings in West Shaw Street (including turbine house and works offices); manager, John Walker & Co., sugar refiners.

Hinckley. — Canteen, Brookfield Road; Burgess Products, Ltd.

Additions at fire station, for U.D.C.; A. S. Atkins, clerk, 16, Station Road.

Horsforth.—Canteen, Fletcher Bank Council School for West Riding E.C.; H. Wormald, county education architect, County Hall, Wakefield.

Jarrow.—Three community kitchens, additional houses, and the completion of 20 houses at Simonside; J. S. Weir, borough engineer.

Canteen and lavatories at the Jarrow Tube Works; Bewley & Scott, contractors, Dunston-on-Tyne.

Kettering.—Additions, Thorngate Street; Freeman, Hardy & Willis, Ltd.

Lancashire.—Remand home, Fylde area, central kitchen at Huyton, and feeding centres at Urmston and Flixton, for C.C.; S. Wilkinson, county architect, County Offices, Preston.

Lancaster. — Rebuilding premises, St. George's Quay; Lunesdale Farmers, Ltd., 1, Cable Street.

Leicester.—Feeding centres for T.C.; city surveyor, Town Hall.

Limavady.—Improvements at Roe Valley District Hospital (£1,300), for Board of Guardians.

Luton.—Erection of stores, etc., rear of County Workshops for the Blind, Leicester Road, for Beds. C.C.; County Architectural Department, Shire Hall, Bedford.

Manchester.—Extensions, Tame Street Institution, for P.A.C.; G. Noel Hill, city architect, Town Hall.

Mansfield.—Bakery extension, Mount Street; W. Brown.

Newcastle - on - Tyne. — Additions to Newbiggin Hall for the City Council (£932); John Tully & Son, builders, Blackhill, Co. Durham.

Ordsall.—British Restaurant, Ordsall Park, for Salford City Council; W. A. Walker, City Engineer, Town Hall, Bexley Square.

Redhill.—Community feeding centre, for Reigate T.C.; borough engineer, Municipal Buildings, Reigate.

Rochdale.—Adaptation of premises, Back Oldham Road, as British restaurant, including heating, etc., installation, for T.C.; H. Bann, town clerk, Town Hall.

Rothwell.—Store premises, Jubilee Street; J. T. Butlin & Son, Ltd., Kettering Road.

Salford.—Structural alterations to "Irwell Castle" hotel; J. Williams, 10, Gt. Clowes Street, Lower Broughton, Salford.

Scorton (North Riding).—Hostel for 30 land girls; F. Blenkinsopp, surveyor, Rural Council Offices, Richmond, Yorks.

Sedgley.—Feeding and cooking centres for U.D.C.; surveyor, Council Offices.

Sheffield.—Additions, Mount Tabor and Sharrow Lane Methodist Schools, for E.C.; city engineer.

Wakefield.—Adaptation of Nortonthorpe Hall as remand home (£6,000) and erection of canteen at Horsforth Feather Bank School (£500) for the E.C.; city architect.

Wallsend.—Alterations at Bewicke Park Hotel, for Blayney & Co., Ltd.; Marshall, Tweedy and Bourne, architects, Grainger House, Blackett Street, Newcastle-on-Tyne.

Wolverhampton.—Day nurseries for T.C.; H. B. Robinson, borough engineer, Town Hall.